Cape Peninsula
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SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM ACCREDITATION: A CASE STUDY OF A UNIVERSITY OF TECHNOLOGY TEXTILE TESTING LABORATORY

by

Desiree Virginia Jaftha

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Supervisor: P.A. McLaren
Co-supervisor: Prof. Dr. J. André Watkins

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DECLARATION

I, Desiree Virginia Jaftha, hereby declare that the contents of this dissertation submitted for the degree Magister Technologiae at the Cape Peninsula University of Technology, represent my own original unaided work, and that the dissertation has not previously been submitted to any other institution of higher education towards any qualification. I further declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Desiree Virginia Jaftha

September 2008

DEDICATION

"This study is dedicated to my husband Ryan, daughter Lee-Shay, son Lemuel and parents Elizabeth & Bennett Phillips for their love and support"

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"I would like to express my sincere gratitude and appreciation to the following:

Jesus Christ my Sovereign Savior for giving me the strength and endurance to complete this dissertation.

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ABSTRACT

Author:	Desiree Virginia Jaftha ND Textile Technology BTech Quality
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University/Institution:	Cape Peninsula University of Technology
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Supervisor:	Prof. J A Watkins
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The South African Government provides support to the clothing and textile industry by making funding available through programs in the Department of Science and Technology, such as the Tshumisano Technology Stations Program. The Technology Stations Program in particular supports a Technology Station in Clothing and Textiles (TSCT) at the Cape Peninsula University of Technology (CPUT), serving the needs for technology support and skills upgrading of the industry in the Western Cape, and in some instances, nationally.

The TSCT testing laboratory provides testing services to small medium and large companies in South Africa at a reduced cost. The laboratory emphasises that customers should have fabrics tested before production commences. In this regard, the company will know the quality of the fabric or garment being purchased or manufactured.

The laboratory technicians and assistants undergo a 'Woolworths' certification process on their test methods on an annual basis. The Woolworths certification is customer based. The laboratory is faced on a daily bases with the problem that more and more of their customers request that the facility should seek higher 'accreditation', as opposed to the current 'certification' it currently holds. The

TSCT testing laboratory in addition has a responsibility to satisfy all of its customer certification and accreditation needs. Against this background, the management of the CPUT TSCT testing laboratory is now seeking accreditation from the South African National Accreditation System (SANAS) to widen the spectrum of its testing abilities.

The primary research objectives of this dissertation are:

- To determine what the requirements are for SANAS accreditation by the CPUT TSCT testing laboratory.
- To determine if the CPUT TSCT testing laboratory is subject to a forced intervention for SANAS accreditation.
- To determine the criteria required for the CPUT TSCT testing laboratory accreditation.
- To determine the benefits that could be gleaned from this accreditation.
- To determine the effectiveness of the laboratory system, with regard to the fact that in addition to testing, the laboratory is used for teaching and learning.

Descriptive research will serve as the research type, as it will describe an existing phenomena taking place. The research will be theoretical in nature and conducted in terms of both positivistic and phenomenological paradigms. Case study research will serve as research method. Data collection for the proposed research will be conducted using questionnaires. The CPUT Clothing and Textile Technology Department will serve as sampling frame, while the sample of respondents will be drawn on the basis of probability sampling. The sample will include lecturing staff, students, industry testing customers, textile test laboratory technicians, administration and support staff, all of whom are directly involved with the operation or make use of the laboratory facilities.

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GLOSSARY OF TERMS

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Accreditation Forum: It is the world association of Conformity Assessment Accreditation Bodies and other bodies interested in conformity assessment in the fields of management systems, products, services, personnel and other similar programs of conformity assessment.

Accreditation: Accreditation is a process in which certification of competency, authority, or credibility is attained.

Certification: Certification refers to the confirmation of certain characteristics of an object, person, or organization. This confirmation is often, but not always, provided by some form of external review, education, or assessment.

CHAPTER 1: SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND MOTIVATION

The Cape Peninsula University of Technology (CPUT) is situated in Cape Town, South Africa. The university comprises of six faculties, namely:

- The faculty of Engineering.
- The faculty of Health and Wellness Sciences.
- The faculty of Informatics and Design.
- The faculty of Education and Social Sciences.
- The faculty of Business.
- The faculty of Applied Sciences.

The Department of Clothing and Textile Technology forms part of the Engineering faculty of the CPUT. In this department, there are two educational programs, namely that of Clothing Management and Textile Technology. The Technology Station in Clothing and Textiles (TSCT) forms part of the Department of Clothing and Textile Technology.

The TSCT is a project funded through the Tshumisano Trust by the Department of Science and Technology, to provide innovation support to small and medium businesses. The entity offers the following range of specific services to the clothing and textile sector in South Africa, namely:

- Product process consulting,
- quality and product testing,
- demonstration and training , and
- product development and research.

The TSCT comprises of a textile testing laboratory, forming the key focus of the research. One of the key features of this laboratory is that it consists of the latest state of the art textile testing equipment. Underpinning this key feature, all the laboratory assistants and technicians are in possession of at least a National Diploma in Textile Technology or Clothing Management. In addition to being a

functional laboratory for academic purposes, the laboratory provides the clothing and textile manufacturers of South Africa with the necessary tests and analytical services to ensure that their products meet the required standard specified by their customers. The laboratory also provides expert technical advice and research on remedial action to ensure that corrective and preventative action is taken on textile non-conformances in companies. These services are offered in both wet and dry processing of raw material, construction, make-up, end use and care of textile materials.

The South African Government provides support to the clothing and textile industry in South Africa, by making funding available through programs sponsored by the Department of Science and Technology such as the Tshumisano Technology Stations program. The Technology Stations Program in particular supports the TSCT at the Cape Peninsula University of Technology, serving the needs for technology support and skills upgrading of the industry in the Western Cape, and in some instances, nationally.

1.2 BACKGROUND TO RESEARCH PROBLEM

The TSCT testing laboratory provides testing services to small medium and large companies in South Africa at a reduced price. The laboratory emphasises that the customer should have fabrics tested before production commences. In this regard, the company will know the quality of the fabric or garment being purchased or manufactured.

The testing laboratory makes use of test methods and procedures of various standards to perform these testing services. The standards and methods include:

- The South African Bureau of Standards (SABS).
- The International Standards Organisation (ISO).
- The British Standards (BSI).
- The American Society for Testing and Materials (ASTM).
- The American Association of Textile Chemists and Colourists (AATCC).
- The Woolworths Test Methods (Marks & Spencers).

The laboratory technicians and assistants undergo a Woolworths certification process on their test methods on a annual basis. This certification is customer based. The laboratory is faced on a daily bases with the problem that more and more of their customers request that the facility should seek higher accreditation. The laboratory in addition has a responsibility to satisfy all of its customer certification and accreditation needs. It is in this regard that the management of the CPUT TSCT testing laboratory is now seeking accreditation from the South African National Accreditation System (SANAS).

1.3 STATEMENT OF THE RESEARCH PROBLEM

Against the above background the research problem to be researched within the ambit of this dissertation reads as follows: "Industry demands that the CPUT TSCT testing laboratory obtain SANAS accreditation".

1.4 THE RESEARCH QUESTION

The research question to be researched within the ambit of this dissertation reads as follows: "Will the CPUT TSCT testing laboratory subject to a forced intervention for SANAS accreditation, meet the set requirements?"

1.5 INVESTIGATIVE SUB- QUESTIONS

The investigative questions to be researched in support of the research question reads as follows:

- How would the CPUT TSCT testing laboratory go about seeking SANAS accreditation?
- Will the CPUT TSCT testing laboratory meet the requirements for SANAS accreditation?
- What benefits would the laboratory gain for the CPUT with the SANAS accreditation?
- What benefits would there be for the industry if the laboratory gains SANAS accreditation?

- How will the CPUT TSCT testing laboratory ensure the effectiveness of the laboratory system, with regard to the fact that in addition, the laboratory is used for teaching and learning purposes?

1.6 PRIMARY RESEARCH OBJECTIVES

The primary research objectives of this dissertation are:

- To determine what the requirements are for SANAS accreditation by the CPUT TSCT testing laboratory.
- To determine if the CPUT TSCT testing laboratory is subject to a forced intervention for SANAS accreditation.
- To determine the criteria required for the CPUT TSCT testing laboratory accreditation.
- To determine the benefits that could be gleaned from this accreditation.
- To determine the effectiveness of the laboratory system, with regard to the fact that in addition to testing, the laboratory is used for teaching and learning.

1.7 THE RESEARCH PROCESS

Remenyi, Williams, Money and Swartz (2002:64-65), explains the research process as consisting of eight specific phases, namely:

- Reviewing the literature.
- Formalising a research question.
- Establishing the methodology.
- Collecting evidence.
- Analysing the evidence.
- Developing conclusions.
- Understanding the limitations of the research.
- Producing management guidelines or recommendations.

The above stated research process will be followed in this dissertation.

1.8 RESEARCH DESIGN AND METHODOLOGY

The type of research that will be conducted will be descriptive research, as it will be research which describes phenomena as they exist. The research will be undertaken in the social world. According to Babbie (2005:12), "...social science has to do with how things are, and why". The research will be theoretical in nature and conducted in terms of both positivistic and phenomenological research paradigms.

Case study research will serve as the research method in the dissertation. According to Yin (1994:19), a research design can be defined as, "... the logical sequence that connects the empirical data to a study's initial research question and ultimately, to its conclusions. Colloquially, a research design is an action plan from getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions and answers about these questions".

The CPUT TSCT testing laboratory processes will serve as the unit of analysis, while the CPUT Clothing and Textile Technology department will serve as the sampling frame. Sample selected will be executed using probability sampling, using the random sampling method. Questionnaires, interviews and test requests will serve as data collection methodology.

According to Yin (1994:1), case study research can be used in many situations, including:

- Policy, political science, and public administration research.
- Community psychology and sociology research.
- Organisational and management studies.
- City and regional planning research, such as studies of plans, neighbourhoods or public agencies.
- Research into the social sciences, the academic disciplines as well as professional fields such as business administration, management sciences, and social work.

A case study according to Yin (1994:6-7), is an empirical enquiry that investigated a contemporary phenomenon within its real-life context, especially

when the boundaries between phenomenon and context are not clearly evident. Furthermore:

- Case study research aims not only to explore certain phenomena, but also to understand them in a particular context.
- 'How' and 'why' questions are explanatory, and likely to be used in case study research.
- A case study illuminates a decision or set of decisions – why they were taken. How they were implemented, and with what result.
- The case study as a research strategy comprises an all-encompassing method – with the logic of design incorporating specific approaches to data collection and analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone, but 'a comprehensive research strategy'.
- A case study is typically used when contextual conditions are the subject of research.

1.9 DATA VALIDITY AND RELIABILITY

According to Collis and Hussey (2003:186), 'validity' is concerned with the extent to which the research findings accurately represents what is happening. More specific, whether the data is a true picture of what is being studied. According to Cooper and Schindler (2006:318-320), three major forms of validity can be identified, namely 'content validity', criterion-related validity' and 'construct validity', which is expanding upon below to provide a holistic perspective of each of the concepts:

- **Content validity:** Content of the measuring instrument is the extent to which it provides adequate coverage of the investigative sub-questions guiding the study. If the instrument contains a representative sample of the universe of subject matter of interest, then content validity is good.

- **Criterion-related validity:** Reflects the success of measures used for prediction or estimation. Any criterion measure must be judged in terms of the following qualities:

  - **Criterion is relevant:** If the criterion is defined a scored in the terms we judge the proper measures of success.

- **Freedom from bias:** When the criterion gives such respondent to opportunity to score well.
- **Reliability:** A reliable criterion is stable and reproducible.
- **Availability:** The information specified by the criterion must be available.

- **Construct validity:** In attempting to evaluate construct validity, both the theory and the measuring instrument being used should be considered. According to Collis and Hussey (2003:59), construct validity relates to the problem that there are a number of phenomena, which are not directly observable, such as motivation, satisfaction, ambition and anxiety. These are known as hypothetical constructs, which are assumed to exist as factors which explain observable phenomena. As an example, one may observe someone shaking or sweating before an interview. However, this is not an observation of anxiety, but a manifestation of anxiety.

Reliability also referred to as 'trustworthiness', is concerned with the findings of the research (Collis & Hussey, 2003:186). The findings can be said to be reliable if you or anyone else repeated the research and obtained the same results. There are three common ways of estimating the reliability of the responses to questions in questionnaires or interviews, namely 'test re-test method', 'split-halves method' and the 'internal consistency method':

- **Test re-test method:** The questions are asked of the same people, but on two separate occasions. Responses of the two occasions are correlated and the correlation coefficient of the two sets of data computed, thus providing an index of reliability.
- **Split-halves method:** The questionnaires or interview record sheets are divided into two equal halves. The two piles are then correlated and the correlation coefficient of the two sets of data computed, thus providing index of reliability.
- **Internal consistency method:** Every item is correlated with every other item across the entire sample and the average inter-item correlated is taken as the index of reliability.

1.10 ETHICS

In the context of research, according to Saunders, Lewis and Thornhill, (2000:130),"...ethics refers to the appropriateness of your behavior in relation to the rights of those who become the subject of your work, or are affected by it". Most ethical issues in research fall into one of four categories namely, protection from harm, informed consent, right to privacy, and honesty with professional colleagues (Leedy &Ormrod, 2001:107-108):

- **Protection from harm:** Should the nature of the study involve psychological discomfort, participants should know of it ahead of time, and any necessary debriefing or counseling should follow immediately after their participation.
- **Informed consent:** Participants should in advance be told about the nature of the study to be conducted, and be given the choice of either participating or not participating.
- **Right to privacy:** Any research study should respect participant's right to privacy. Participant data should be kept confidential.
- **Honesty with professional colleagues:** Research findings should be reported in a complete and honest fashion, without misrepresenting what they have done or intentionally misleading others as to the nature of their findings.

Mouton (2001:238), is of the opinion that the ethics of science concerns what is wrong and what is right in the conduct of research. Because scientific research is a form of human conduct, it follows that such conduct has to conform to generally accepted norms and values. As in any sphere of human life, certain kinds of conduct are morally acceptable, whereas others are not.

Mouton (2001:239) avers that ethical issues arise from our interaction with other people, other beings such as animals and the environment, especially at the point where there is potential or actual conflict of interests. In many cases what is right for one person might not be right for other people. In some cases, doing the right thing might involve placing the greater good ahead of specific benefits that might accrue to oneself. In many cases, ethical choices involve a trade-off or compromise between the interest and rights of different parties.

1.11 RESEARCH ASSUMPTIONS

The research assumptions for this research are:

- The laboratory will meet all the requirements for SANAS accreditation.
- The students using the laboratory will benefit from the SANAS accreditation.
- The laboratory testing clients will benefit from the SANAS accreditation.
- The laboratory will reap all the benefits of being SANAS accredited.

1.12 RESEARCH CONSTRAINTS

Research constraints refer to any applicable inhibiting factor which would in any way constrain the research student's ability to conduct the research in a normal way. This can primarily be attributed to two factors:

- **Limitations:** Students and laboratory customers may not wish to participate in research.
- **Delimitations:** Interviews and questionnaires will be limited to TSCT testing laboratory customers and students and staff of CPUT.

1.13 CHAPTER AND CONTENT ANALYSIS

The following chapter and content analysis will be applicable in this research study:

Chapter 1: Scope of the research.

Chapter 2: A holistic perspective of the research environment.

Chapter 3: Literature review of SANAS accreditation.

Chapter 4: Data collection design and methodology.

Chapter5: Data analysis and interpretations of results.

Chapter6: Conclusion.

CHAPTER 2: A HOLISTIC PERSPECTIVE OF THE RESEARCH ENVIRONMENT

2.1 INTRODUCTION TO TEXTILES

Textiles cover a wide spectrum of applications. It is of significance to note that, when the word 'textiles' is mentioned during the course of normal conversation, invariably people think of its application in terms of clothing. However, the textile industry is the fourth largest industry in the world. This particular industry provides both direct and indirectly employment to millions of people worldwide (FAO/ESCORNA 2005:Conference). As the industry is so diverse it is split into twelve major application areas of textiles namely Agrotech., Buildtech., Clotech., Geotech., Hometech., Indutech., Medtech., Mobiltech., Oekotech., Packtech., Protech., and Sportech. These major applications (Techtextil, 2005:Exhibition), are elaborated upon below to provide a high level perspective of the extent of the industry:

- **Agrotech:**
  - Soil covering material for horticulture and agriculture.
  - New textile developments for earlier harvesting.
  - Textile drainage and irrigation systems.
  - Woven and knitted fabrics for providing shade.
  - Greenhouse equipment.
  - Forestry textiles.
  - Flexible water tanks and sealing sheets.
  - Lifting and conveying systems.
  - Temporary agricultural buildings.
  - Textiles for landscaping and fences.
- **Buildtech:**
  - Textile reinforcement for concrete and other precipitation hardening masses.
  - Light weight construction materials.
  - Textile facade substructure systems.
  - Cold, heat and sound insulation.

- Temporary constructions and pneumatic structures.
- Textile roofings, roofing sheets and sunscreen textiles.
- Exterior and exterior noise bearer walls.
- Textile air distribution and air conditionings systems.
- Pipe renovation methods based on textile hoses.
- Textiles for soil stabilization.
- Tent and tent frames.

- **Clotech:**
  - Shoes.
  - Clothes.
- **Geotech:**
  - Subsoil reinforcenment.
  - Landscaping, earthworks, road construction, riverbank and coast reinforcement.
  - Water engineering, soil sealing and drainage systems.
- **Hometech:**
  - Textile composites for interior fittings and furnishings.
  - Carpets and upholstery fabrics.
  - Sunscreen textiles and awning material.
  - Ceiling and wall coverings.
  - Textile reinforced structural components and mouldings.
  - Fire blocker.
- **Indutech:**
  - Textile sheets products for reinforcing purposes.
  - Textile for use in hot and cold media.
  - Textiles for use in corrosive media.
  - Antistatic textiles.
  - Textiles for the electronics industry and date systems technology.
  - Textile reinforced motor parts.
  - Lifting and conveying systems.
  - Rigid and flexible containers.
  - Pneumatic hollow body systems.
  - Filters/filtration and sorption systems.
  - Seals and fibre reinforced sealing components.

- Closure systems.
- Sound insulation products.
- Textiles for the painting and coating sector.
- Textile reinforced armoured materials.
- Substrates for coating, film lamination and gumming.

- **Medtech:**
  - Hygienic fleeces and dressing materials.
  - Textile reinforced prostheses.
  - Textile products for surgery.
  - Hospital bed linen and blankets.
  - Doctors and nurses clothing.
  - Personal hygiene textile products.
  - Equipment for rescue service.
  - Textiles for medical equipment.
- **Mobiltech:**
  - Aerospace, rail vehicles, automobiles and ship building.
  - Textiles for covering plastic surfaces.
  - Passenger safety systems, airbags.
  - Interior cladding.
  - Intake air filters and air distribution systems.
  - Tyres, ceiling and wall covering.
  - Protective covers for aircraft, water vehicles and land vehicles.
  - Security and military equipment.
- **Oekotech:**
  - Textile drainage systems.
  - Erosion prevention textiles.
  - Textiles for protection against hazardous substances.
  - Landfill textiles.
- **Packtech:**
  - Packaging material.
  - Protective covering for short and long term conservation.
  - Sacks and big bags.
  - Mobile containers for temporary storing.
- **Protech:**

- Temperature and chemical protection clothing.
- Weatherproof, waterproof, bulletproof and windproof clothing.
- Chemical protection equipment.
- Equipment for rescue service.
- Fire protection equipment.
- Survival equipment.
- Fire blocker.

- **Sportech:**
  - Textile reinforced sport equipment.
  - Weather and wind protection.
  - Person protection equipment (shin guards).
  - Sportswear and sport equipment.
  - Outdoor gear.

Table 2.1 below reflects the global consumption of technical textiles by application. Horrocks and Anand (2000:11), asserts: "The same study identified size and growth trends in each major application area for technical textiles, as defined by the organisers of Techtextil."

Table 2.1: Worldwide consumption of technical textiles by application. **Source:** Horrocks & Anand (2000:11).

	10^3 tonnes			$ million		
	2000	2005	Growth (%pa)	2000	2005	Growth (%pa)
Mobiltech	2220	2480	2.2	13080	14370	1.9
Indutech	1880	2340	4.5	9290	11560	4.5
Medtech	1380	1650	3.6	7820	9530	4
Hometech	1800	2260	4.7	7780	9680	4.5
Clotech	730	820	2.3	6800	7640	2.4
Agrotech	900	1020	2.5	4260	4940	3
Buildtech	1030	1270	4.3	3390	4320	5
Packtech	530	660	4.5	2320	2920	4.7
Sportech	310	390	4.7	2030	2510	4.3
Geotech	400	570	7.3	1860	2660	7.4
Protech	160	220	6.6	1640	2230	6.3
Oekotech	230	310	6.2	1270	1610	4.9

2.2 BACKGROUND TO THE TEXTILE INDUSTRY IN SOUTH AFRICA

According to South Africa info (2008*a*:**Online**), South Africa has developed and established a diversified manufacturing base that has shown its resilience and potential to compete in the global economy.

The manufacturing sector provides a locus for stimulating the growth of other activities, such as services, and achieving specific outcomes, such as employment creation and economic empowerment. This platform of manufacturing presents an opportunity to significantly accelerate the country's growth and development (South Africa info, 2008*a*:**Online**).

According to South Africa info (2008*a*:**Online**), manufacturing in South Africa is dominated by the following industries:

- Agriprocessing.
- Automotive.
- Chemicals.
- Information Communication Technology and electronics.
- Metals.
- Textiles, clothing and footwear.

South Africa info (2008*b*:**Online**), emphasise the fact that the South African textile and clothing industry has a powerful vision. It aims to use all the natural, human and technological resources at its disposal to make South Africa the preferred domestic and international supplier of South African manufactured textiles and clothing. Although the textile and apparel industry is relatively small, it is well placed to make this vision a reality.

Due to technological developments, local textile production has evolved into a capital intensive industry, producing synthetic fibres in ever increasing numbers. The apparel industry has also undergone significant technological change and has benefited from the country's sophisticated transport and communications infrastructure (South Africa info, 2008*b*:**Online**).

The South African market demands, increasingly reflect the sophistication of First World markets and the local clothing and textile industry has grown accordingly to supply the full range of services from natural and synthetic fibre production to non-woven, spinning, weaving, tufting, knitting, dyeing and finishing (South Africa info, 2008*b*:**Online**). In South Africa, the Clothing Textile Footwear and Leather (CTFL) Sector Education and Training Authority (SETA), categorises the apparel industry into 3 subsectors:

- Clothing and Textiles,
- footwear, and
- leather.

The reciprocal value chain of the textile industry includes:

- Manufacturing,
- distributing, and
- retailing.

2.3 BENEFITS OF THE INDUSTRY

According to South Africa info (2008*b*:**Online**), reports that about US$900 million has been spent on modernising and upgrading the industry, making it efficient, internationally competitive, and ready to become a major force in the world market since 1994. In this respect, exports account for R1,4 billion for apparel and R2,5 billion per annum for textiles, mostly to the US and European markets. Exports to the US increased by a dramatic 62% in 2001, driven primarily by the benefits offered under the Africa Growth and Opportunity Act (AGOA), which provides for duty-free imports of apparel produced in South Africa (South Africa info, 2008*b*:**Online**).

2.4 THE TEXTILE FEDERATION OF SOUTH AFRICA

Texfed (2008*a*:**Online**), explains that the Textile Federation (Texfed), formed in 1975, acts as the voice and spokesman for its members on key industry issues. Its main focus areas are trade matters and legislative changes that affect the industry. Separate structures have been created to deal with labour and bargaining issues.

According to Texfed (2008*a*:**Online**), the Textile Federation is comprised of five Constituent Trade Associations namely:

- The South African Cotton Textile Manufacturers' Association (SACTMA).
- The South African Worsted Manufacturers' Trade Association (SAWMTA).
- The National Fabric Knitters' Trade Association (NFKTA).
- The South African Technical Textile Manufacturers' Association (SATTMA).
- The Fiber Group.

Texfed (2008*a*:**Online**), reports that the federation represents the full complement of cotton, wool and worsted yarn and woven fabric textile manufacturers and about seventy percent of the fabric knitting mills in South Africa. Texfed has played a major role in dealing and influencing the many issues that have affected the industry, both nationally and internationally over the past 30 years. It acts as the principal link between the textile industry and the various government agencies and departments and other local and international trade associations and organisations. Its activities have resulted in the maintenance of a strong and resilient industry against the backgound of recurrent and ever increasing threats from imports from low cost producers, and the onslaught from different areas of the textile world.

What has already been accomplished is due to a sound, dedicated and involved leadership, exemplary teamwork and active membership support. This should place the Federation and the textile industry in a good position to counter the increasing level of threat from abroad and continue to safeguard the welfare of the industry itself (Texfed, 2008*a*:**Online**).

2.4.1 The Textile Federation members.

According to Texfed (2008*a*:**Online**), the Federation is a member driven organisation and acts under the direction of an executive board on behalf of its membership. It provides a wide range of information to its members and also to a wide range of industry stakeholders and represents the industry on key issues. Some of the principal functions of the Federation (Texfed, 2008*a*:**Online**), are outlined as follows:

- Maintaining of effective protection against excessive imports utilising the tariff, rebates countervailing and anti-dumping applications.
- Promoting export.
- Participating in international trade negotiations involving input on the tariffs, rules of origin and non-tariff barriers.
- Assisting the authorities in combating illegal imports.
- Interacting with the International Trade Administration Commission and the Department of Trade and Industry, the SA Revenue Services including Customs and Excise.
- Analyzing Import and Export Trade Statistics.
- Performing comparative analysis and evaluation of imports in the domestic market.
- Analysing and disseminating of official government, internal and international industry related statistics.
- Analysing the market size, shifts of patterns of demand and national economics.
- Presenting regular dissemination of statistics and market information to members and other stakeholders.
- Carry out general administrative services.
- Publicity and public relations.
- Interaction with foreign embassies, trade missions and chambers of commerce and industry.

According to Texfed (2008*a*:**Online**), the Textile Federation distributes amongst its members the following of its publications:

- "*Textile Statistics and Economic Review*", an annual publication.
- A monthly bulletin containing updates on changes to legislation, tariffs and other trade related developments.
- A monthly statistical bulletin – "*Textile Brief Statistics*"
- Monthly Comparative Trade Statistics.

For a list of details and products of companies who are members of the Textile Federation of South Africa, see Annexure C.

2.5 FACTORS IMPACTING ON THE TEXTILE INDUSTRY OF SOUTH AFRICA

According to Texfed (2008*b*:**Online**), the South African textile industry is currently facing extremely difficult trading conditions. Employment in the industry has declined from 70 500 in the year 2003, to just below 50 500 in the year 2006. In addition a number of textile mills have recently closed and have been forced to retrench staff.

Texfed (2008*b*:**Online**), reports that imports are at an all time high. Imports of yarns have increased from 77 000 tons in the year 2001, to 99 000 tons in the year 2006, representing an increase of 29%, while imports of fabrics have remained relatively constant with 94 900 tons imported in the year 2001 and 95 300 tons imported in the year 2006. Much larger increases were recorded by imports of made up textiles, which have increased from 4 900 tons in the year 2001 to 28 700 tons in the year 2006. This represented an increase of nearly 500%, while imports of clothing which increased from 139 million items in the year 2001 to 567 million items in the year 2006, representing an increase of over 300%.

Texfed (2008*b*:**Online**), noted that historically textile and clothing imports into South Africa originated from a wide range of countries, however primary suppliers were Taiwan, South Korea and Europe. However since 2001, imports have increasingly been sourced from China. In the case of clothing imports, 89% currently originates from China, 3% from India and the remaining 8% from the rest of the world, while 60% of all made up textiles (blankets, bed sheets, towels and curtains) originate from China.

According to Texfed (2008*b*:**Online**), the China Restraint Arrangement was introduced on 1 Jan 2007. There have been subsequent changes to the original quota regulations, and these were introduced on 27 March 2007. The changes included the following:

- A tightening of the definition of 'foreign brands'.
- A provision for additional quota for special purpose clothing e.g. firemen's gear and specialised sporting gear.

- A provision for additional quota for special strategic circumstances whereby increased quota will be granted subject to written commitments by importers to increase local procurement over a 5 year time period and to support technology upgrading and skills development in the local industry.

According to Texfed (2008*b*:**Online**), the latest import statistics on quota usage for the first two months of the year 2007 is shown in Table 2.2 below:

Table 2.2: Import statistics. **Source:** Texfed (2008*a*:**Online**)

Category	**Quota Usage**
Textiles	6% utilized (range 2% to 15%)
Clothing	10% utilized (range 2% to 31%)

Texfed (2008*b*:**Online**), found that the low quota usage is due to imports being brought in ahead of the quota regime during November and December 2006. The quota has had positive effects. Some sectors of the textile industry have seen an upturn in business as a result of the quotas, but this is not universal across all sectors of the industry. Much stock is being laid on the special strategic circumstance provision, whereby it is envisaged that benefits beyond the two year term of the quotas will be leveraged. A summary of the China quota is set out in Table 2.3 below:

Table 2.3: China quota summary. **Source:** Texfed (2008*a*:**Online**)

Description	**Units**	**Imports**	**Quotas**		**Quota %**	
		Jan 05-Jun 06	**2007**	**2008**	**2007**	**2008**
Total Fabric	'000kg	17 384	13 930	16 304	120%	141%
Knitted Clothing	'000No.	170 684	74 907	81 666	66%	72%
Woven Clothing	'000No.	211 297	101 084	109 931	72%	78%
Curtains	'000kg	6 122	4 778	5 151	117%	126%

According to Texfed (2008*b*:**Online**), the Customised Sector Program (CSP) was finalised in August 2006. However, since that time the Retail Sector has withdrawn its support for the CSP and consequently the program has not yet been introduced. The CSP is intended to develop and modernise the textile and clothing

industries and to put them on a path to higher competitiveness. It embraces the following aspects:

- Domestic market development.
- Promoting exports.
- Competitiveness by upgrading technology and investments.
- Upgrading skills.
- Empowerment.
- Pursuing a partnership approach.

Texfed (2008*b*:**Online**), found that at this stage, the only progress under the CSP is that some of the projects contained within the program are being advanced. These are:

- Country of Origin labeling.
- Replacement for the DCC Scheme.
- Developing a capital upgrade provision for the sector.

2.5.1 Clothing and Textile Interim Development Program (CTIDP)

According to Texfed (2008*b*:**Online**), the previous export promotion scheme for the textile and clothing industries, the 'Duty Credit Certificate Scheme', expired at the end of March 2007. No replacement scheme has yet been introduced to date. The resultant uncertainty has a negative impact on exporters.

Texfed (2008*b*:**Online**), points out that the following trade agreements are currently in effect:

- Africa Growth and Opportunity Act.
- South Africa/European Union (EU) Trade Development and Cooperation Agreement.
- Southern African Development Community (SADC) Free Trade Agreement.

Texfed (2008*b*:**Online**), points out that following trade agreements are under negotiation:

- South African Customs Union (SACU)/European Free Trade Association (EFTA) Free Trade Agreement (soon to be implemented).
- SACU/Mercosur Preferential Trade Agreement.
- SADC Free Trade Agreement Mid-term Review.

- SADC(8)/EU Economic Partnership Agreement (EPA).
- World Trade Organization Doha Development Round.
- SACU/India Preferential Trade Agreement.

Table 2.4 below reflects the Textile Industry Statistics from the year 2001 to 2006:

Table 2.4: Textile Industry Statistics 2001-2006. **Source:** Texfed (2008*a*:**Online**)

	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Volume of Production (2000=100)	103.1	111.7	98.8	101.3	92.8	92.3
Sales (R'billion)	16.9	20.4	19.2	19.7	19.0	18.4
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Employment ('000)	64.1	65.5	70.5	61.7	52.8	50.5
Imports (R'billion)	5.2	6.9	5.9	6.5	6.4	6.9
Exports (R'billion)	3.4	4.5	3.8	3.2	3.2	3.1

CHAPTER 3: LITERATURE REVIEW OF SANAS ACCREDITATION, ISO AND LABORATORY ACCREDITATION BODIES

3.1 INTRODUCTION

In this chapter, a literature review will be conducted on the primary theme of this dissertation, namely that of the South African National Accreditation System (SANAS) accreditation of the CPUT TSCT testing laboratory. Furthermore, the International Standards Organisation (ISO) in terms of structure, development, importance, significance and benefits will be elaborated upon in detail. In addition, to place the accreditation of the CPUT TSCT testing laboratory in perspective of the overall research, laboratory accreditation bodies, namely the South African Bureau of Standards (SABS), the International Laboratory Accreditation Corporation (ILAC) and the Laboratory Accreditation Bureau (L-A-B), will be analysed in detail.

3.2 BACKGROUND TO SANAS ACCREDITATION

The South African Government has recognised the SANAS as the single National Accreditation Body which provides formal recognition to Laboratories, Certification Bodies, Inspection Bodies, Proficiency Testing Scheme Providers and Good Laboratory Practice (GLP) test facilities, which are competent to perform specific tasks (SANAS, 2008*a*:**Online**). These laboratories are furnished with a certificate that gives formal recognition of competency to perform predetermined specified tasks.

Furthermore, it is an independent body competent of auditing organisations and test laboratories for compliance to the relevant international and national standards. In the instance of the TSCT testing laboratory at the CPUT, the ISO/IEC17025 international standard applies. The body furthermore verifies the appropriate competence of laboratory staff for tasks and activities that needs to be carried out (SANAS, 2008*b*:**Online**). According to International Standard ISO/IEC17025 (2005:vi), this independent assessment and recognition of

competence permits the tests, inspection reports and certification of the accredited laboratory to be acknowledged in line with laboratories in other countries accredited by their National Accreditation Bodies with which SANAS has a Mutual Recognition Agreement (MRA), and to which it is associated.

SANAS participates in and is represented on the major committees in the global accreditation field, and are also involved in the assessments of additional national and regional accreditation bodies (SANAS, 2008*c*:**Online**). The benefits resulting from these activities to the SANAS accredited laboratories are an assurance that the rules applied are of equal standing to other globally accredited laboratories.

3.3 SANAS ACCREDITATION REQUIREMENTS FOR TESTING LABORATORIES

Testing laboratories are accredited for specific test methods or techniques (SANAS, 2008*d*:**Online**). These capabilities must be periodically demonstrated by measurement, using the requirements contained in ISO/IEC 17025. This serves to sustain confidence in the laboratory's ability to perform precise measurements and tests.

Testing laboratories seeking accreditation need to comply with the following requirements (SANAS, 2008*e*:**Online**):

- The quality management, scientific and technical aspects of testing laboratories as it is described in the ISO/IEC 17025 standard.
- All additional regulatory documents specific to the technical field, which may have been developed by the SANAS Specialist Technical Committee (STC) for that particular area.
- Involvement in expertise testing or inter-laboratory comparisons, where possible.

The International Standard ISO/IEC17025 (2005:1), stipulates that if testing and calibration laboratories comply with the requirements of the ISO/IEC17025 standard, these laboratories will be capable of operating a quality management system for their testing and calibration activities, which also meets the principles of the ISO 9001 standard. According to the SABS ISO 9001 (2000:1), it is a

generic quality management system standard, which explains the code of practice for the implementation and maintenance of a quality management system, applied in conjunction with other standards referred to in the ISO 9001 standard document. In this instance, it is in conjunction with the ISO/IEC17025 standard.

3.4 THE PROCESS OF APPLICATION FOR SANAS ACCREDITATION

The following process is to be followed when a laboratory seeks to obtain SANAS accreditation (SANAS, 2008*f*:**Online**):

The laboratory submits a completed application form to the SANAS together with the laboratory's quality manual.

- The SANAS will then provide the prospective applicant with a detailed quotation based on the scope of the application of the laboratory in question.
- The SANAS will then arrange for a document review of the quality manual of the laboratory.
- If the quality manual addresses all the requirements of the ISO/IEC 17025 standard, the SANAS will make arrangements for the initial assessment.
- In the case where all the requirements are not met, the laboratory will be required to make the necessary amendments and resubmit the quality manual to the SANAS.

Figure 3.1 graphically depicts the accreditation process that the SANAS will apply to testing and calibration laboratories.

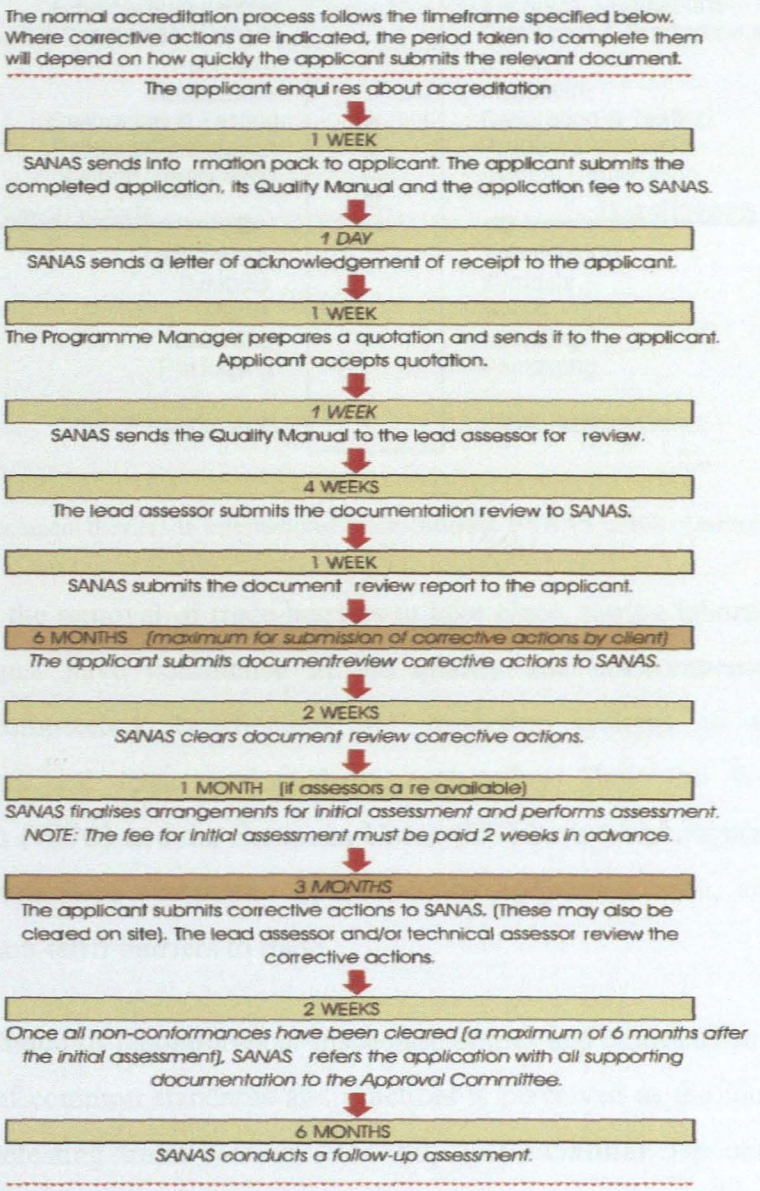

Figure 3.1: Timeframe for the SANAS accreditation process. **Source:** SANAS (2008*b*:Online)

3.5 THE REQUIREMENTS FOR THE TEXTILE TESTING LABORATORY SEEKING SANAS ACCREDITATION

The global trend is in the direction of a free market with no economic trade barriers, permitting free movement of goods and interchange of services (SANAS, 2008*c*:**Online**). This situation can only be accomplished when technical trade barriers are eliminated as well. Figure 3.2 illustrates the technical barriers to international trade between countries.

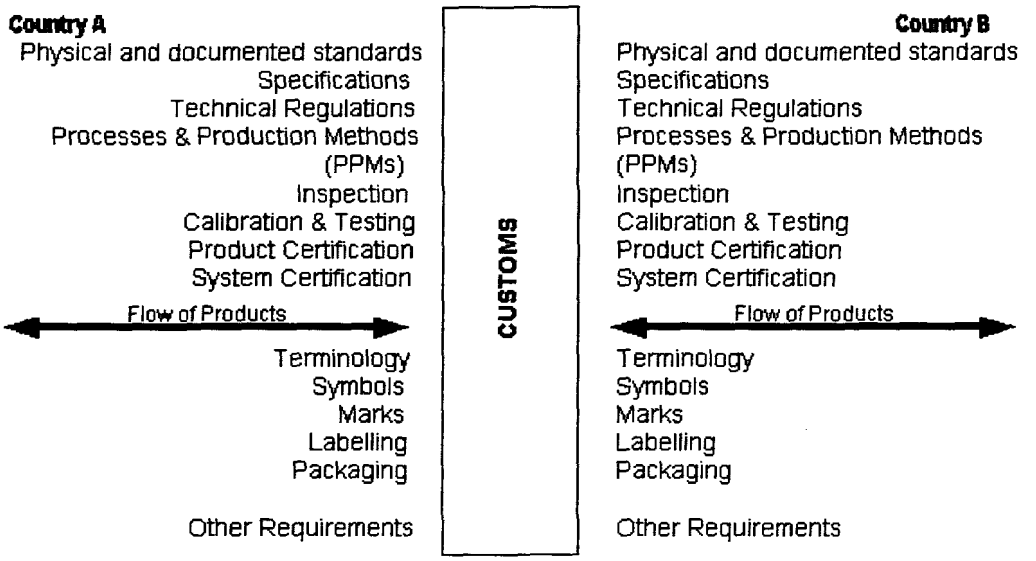

Figure 3.2: Technical barriers to international trade. **Source:** SANAS (2008*c*:Online)

In order for the removal of trade barriers to take place, testing laboratories in all countries must have confidence in the quality and environmental systems, personnel competency, certification and inspection systems as well as the measurements and tests conducted by each other. Both the World Trade Organisation (WTO) and the European Union (EU) have taken cognizance of the fact that the lack of acceptance of test results and certification, are the most significant non-tariff barriers to trade.

The accreditation of laboratories or inspection bodies and certification bodies that makes use of common standards and practices is perceived as the most effective means of defeating trade barriers (SANAS, 2008*c*:**Online**). Up until now, all major trading countries have established independent and internationally credible accreditation bodies. The International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF) are at the top of the world accreditation pyramid, and the SANAS is a member of both.

Defeating trade barriers is achieved through establishing a world-wide network of national accreditation bodies, which will by means of Multilateral Agreements (MLAs), ultimately ensure that the competence of certification bodies, inspection bodies and laboratories both testing and calibration are audited on similar principles, regardless where in the world these are situated. These audits are based on the harmonized ISO standards.

3.6 BENEFITS OF SANAS ACCREDITATION

Laboratories, Certification Bodies, Inspection Bodies and Good Laboratory Practice (GLP) test facilities obtain formal recognition from the SANAS accreditation stating that they are competent to carry out specific tasks (SANAS, 2008*g*:**Online**).Laboratory accredited by SANAS, become stakeholders in SANAS. They are furthermore entitled to use the appropriate SANAS logo on their certificates, reports that are issued, their letterheads and promotional material.

A database is maintained of all the accredited organisations and laboratories (SANAS, 2008*h*:**Online**). This permits prospective customers of the accredited organisations to have access to the information of services provided by the accredited organisations and laboratories.

3.7 THE INTERNATIONAL STANDARDS ORGANISATION

3.7.1 The concept of ISO

The International Standards Organisation 'International Organization for Standardization' has different acronyms in different languages e.g. 'IOS' in English, and 'OIN' in French, for *Organisation internationale de normalization.* It was for this reason that the founders of the organisation decided to give it a short all-purpose name, and chose the name 'ISO' (ISO, 2008*a*:**Online**). This name derived from the Greek word *isos*, meaning 'equal'. As a result, whatever the country, whatever the language, the acronym of the organization will always be 'ISO'.

The ISO (International Organization for Standardization) exist as the world's largest developer and publisher of International Standards in the world (ISO, 2008*b*:**Online**). The organisation consists of a network of the National Standards Institutes in 157 countries. Every country has one representing member and the Central Secretariat in Geneva, Switzerland, coordinates the system.

ISO is a nongovernmental organisation, forming a link between the public and private sectors. Furthermore, many of the ISO member institutes are part of the governmental structure of their respected countries, or are government mandated. Other members of ISO have their roots uniquely in the private sector and have been set up by national joint ventures of industry associations. As a result, ISO facilitate a consensus to be accomplished on solutions that meet both the requirements of business and the wide-ranging needs of society (ISO, 2008*b*:**Online**).

3.7.2 The structure of ISO

The structure of the ISO is graphically depicted in Figure 3.3.

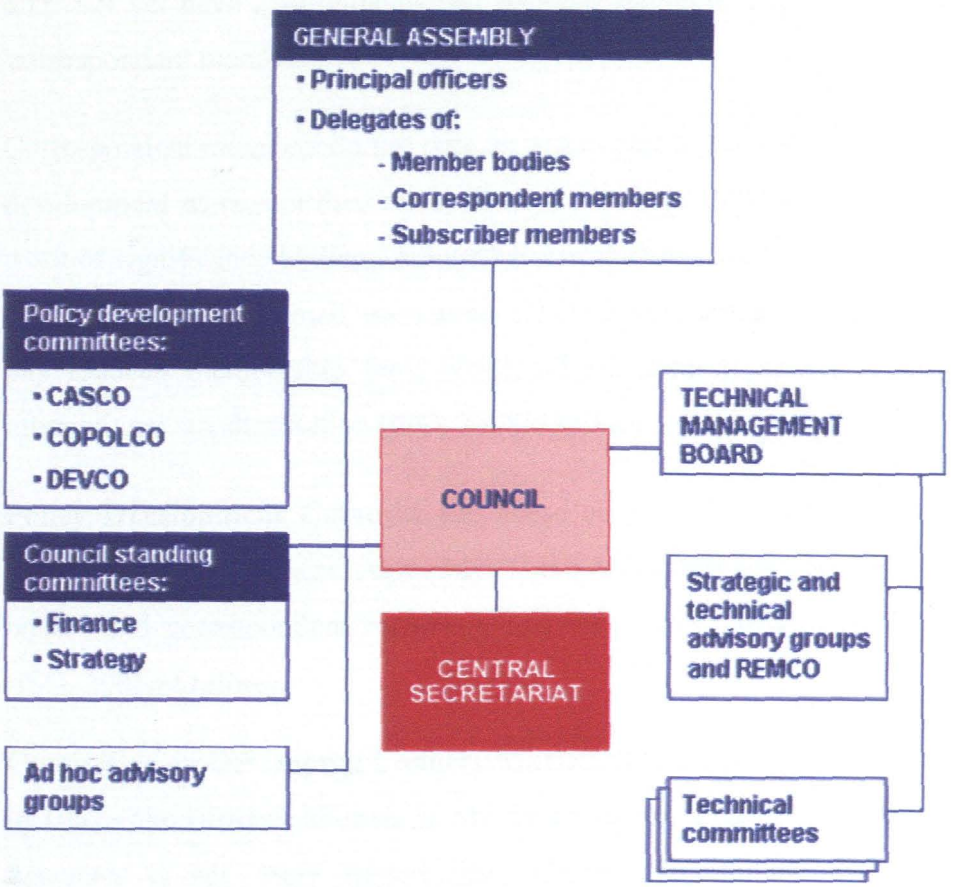

Figure 3.3: Organisational structure of ISO. **Source:** ISO (2008*c*:Online)

The General Assembly of the ISO is constituted by a meeting of the officers and delegates nominated by the member bodies. Correspondent members and

subscriber members may attend as observers. The President is Chairman of the General Assembly (ISO, 2008*c*:**Online**).

The General Assembly meets once a year. The agenda includes issues such as *inter alia*, actions relating to the ISO annual report, an ISO multi-year strategic plan with financial implications, and the annual financial status report by the treasurer on the Central Secretariat.

That the national body of a country is a member body of ISO, that is the 'most representative of standardization in its country' (ISO, 2008*d*:**Online**). ISO only accepts membership of one such body for each country. These member bodies are entitled to participate and exercise full voting rights on any technical or policy committee of ISO. An organisation in a country which does not yet have a fully-developed national standards activity, is usually a 'correspondent member'.

Correspondent members do not take an active part in the technical and policy development work, but they are at liberty to be kept fully informed about the work of significance to them. Subscriber membership has been established for countries with very small economies (ISO, 2008*e*:**Online**). These members pay reduced membership fees, which allows them to retain contact with international standardisation (ISO, 2008*f*:**Online**).

Policy Development Committees: These are Advisory committees that are established by the General Assembly. These commitees are open to all member bodies and correspondent members, and they report directly to the Council (ISO, 2008*g*:**Online**).

Committee on Developing Country Matters (DEVCO): DEVCO was created in 1961. The current chairman is Mr. Iman Sudarwo (2008) of Indonesia. The Secretary is Mr. Beer Budoo (ISO Central Secretariat). This committee membership is open to interested member bodies as participating or observer members and to interested correspondent members as observer members. There are eighty four participating countries and forty seven observer countries (ISO, 2008*h*:**Online**) (ISO, 2008*i*:**Online**).

The terms of reference of DEVCO (ISO, 2008*j*:**Online**) are as follows:

- Identifying the needs and requirements of developing countries in the fields of standardisation and related activities such as conformity assessment including accreditation, quality and metrology. Furthermore, to assist the developing countries, as necessary in defining these needs and requirements.
- Establishing these needs and requirements, to recommend actions to assist the developing countries in meeting them.
- Monitoring the implementation of the ISO Action Plan for Developing Countries.
- Providing a forum for the discussion of all aspects of standardisation and related activities in developing countries, and for the exchange of experience among developing countries and developed countries. This should, carried out in collaboration with the Committee on Conformity Assessment (CASCO), the Committee on Consumer Policy (COPOLCO), the Technical Management Board (TMB) and relevant international organisations.

Council appoints regional liaison officers in an honorary capacity. They are of assistance to the Secretary-General in representing ISO interests in their regions (ISO 2008*k*:**Online**).

The terms of reference of the Council Standing Committee on Finance (CSC/FIN) (ISO, 2008*l*:**Online**) are as follows:

- Acting in an advisory capacity to the Treasurer in relation to his responsibilities as set out in the Statutes and relevant decisions of Council.
- Be kept informed on the financial aspects of ISO/CS management and to advise the Secretary-General and Council on questions related to assessing the significance of the services provided by the ISO/CS to all of the ISO members, to the Technical Committees, the Central Secretariat, and to the governance bodies and policy development committees of ISO.
- Providing advice to Council on other specific financial questions when requested to do so.
- Reporting to Council as appropriate.

The committee comprises of the Treasurer and the appointed representatives of up to nine member bodies elected to Council. Members are appointed by

Council for a two-year term, coinciding with their terms on the Council. From the membership, the chairman is elected by the committee (ISO, 2008*m*:Online)

The terms of reference of the Council standing committee on strategy (CSC/STRAT) according to ISO (2008*n*:**Online**), are as follows:

- Advising Council on appropriate policy and strategic matters and to raise any related issues.
- Preparing annual strategy implementation plans for approval by Council.
- Revising the ISO Strategic Plan every five years for endorsement by Council and subsequent approval by the General Assembly.
- Reporting to Council at least once a year.

The CSC/STRAT committee comprises of the appointed representatives of up to nine member bodies elected to Council. Members are appointed by Council for a two-year term coinciding with their terms on Council. Furthermore, the committee shall comprise of the Chairs of the policy development committees, as ex-officio members. The committee is chaired by the Vice-President (ISO, 2008*o*:**Online**).

The terms of reference of the Committee on conformity assessment (ISO, 2008*p*:**Online**), are as follows:

- Studying means of assessing the conformity of products, processes, services and management systems to appropriate standards or other technical specifications.
- Preparing international guides and standards relating to the practice of testing, inspection and certification of products, processes and services, and to the assessment of management systems, testing laboratories, inspection bodies, certification bodies, accreditation bodies and their operation and acceptance.
- Promoting mutual recognition and acceptance of national and regional conformity assessment systems, and the appropriate use of International

Standards for testing, inspection, certification, assessment and related purposes.

3.7.3 The development of the ISO standards

ISO standards are developed according to the following three principles (ISO, 2008*q*:**Online**):

- **Consensus:** The opinions and interests of all parties are taken into account, namely: manufacturers, vendors and users, consumer groups, testing laboratories, governments, engineering professions and research organisations.
- **Industry wide:** Global solutions to satisfy industries and customers worldwide.
- **Voluntary:** International standardisation is market driven and is consequently based on voluntary involvement of all interests in the market-place.

The ISO standards development process (ISO, 2008*q*:**Online**), has three main phases, which are elaborated upon below:

- The need for a standard is usually expressed by an industry sector, which communicates this need to a national member body. The latter proposes the new work item to ISO as a whole. Once the need for an international standard has been recognised and formally agreed, the first phase involves definition of the technical scope of the future standard. This phase is usually carried out in working groups which comprise technical experts from countries interested in the subject matter.
- Once agreement has been reached on which technical aspects are to be covered in the standard, a second phase is entered into during which countries negotiate the detailed specifications within the standard. This is the consensus-building phase.
- The final phase comprises the formal approval of the resulting draft international standard. The acceptance criteria stipulate approval by two-thirds of the ISO members that have participated actively in the standards

development process, and approval by seventy five percent of all members that vote.

3.7.4 The importance of standards

Standards make a fundamental and positive contribution to most parts of daily lives of people in general (ISO, 2008*r*:**Online**). Furthermore, it ensures the desirable characteristics of products and services such as quality, environmental friendliness, safety, reliability, efficiency and interchangeability at a reasonable cost.

When products and services meet expectations, it is normally taken for granted and the role of standards is not taken into account. However, when standards are not present, it soon becomes apparent amongst the general public. Concerns are soon raised when products turn out to be of poor quality, do not fit, are incompatible with equipment that already exist, are unreliable or dangerous. When standards are met, products, systems, machinery and devices work properly and safely as expected. ISO is the organization responsible for many thousands of the standards which benefit the whole world (ISO, 2008*r*:**Online**).

3.7.5 The significance of having set standards

ISO standards make the development, manufacturing and supply of products and services more efficient, safer and cleaner. It facilitates trade between countries and makes it fairer. In addition, these standards provide governments with a technical base for health, safety and environmental legislation, and conformity assessment. Furthermore, it makes the sharing of technological advances and good management practice possible and disseminates innovation. These standards safeguard consumers and users in general of products and services, and make life simpler by providing solutions to common problems (ISO, 2008*s*:**Online**).

3.7.6 Who will benefit from standards

ISO standards provide technological, economic and societal benefits. In businesses, the widespread adoption of International Standards means that suppliers can develop and offer products and services meeting specifications, that have wide international acceptance in their sectors. As a result, businesses using

International Standards can compete on many more markets around the world (ISO, 2008*t*:**Online**).

The benefits pertaining to innovators of new technologies using international standards relating to terminology, compatibility and safety, speed up the dissemination of such innovations and their development into manufacturable and marketable products. For customers, the worldwide compatibility of technology which is achieved when products and services are based on international standards gives them a broad application choice. Customers also benefit from the effects of competition among suppliers.

With regard to governments, international standards provide the technological and scientific bases underpinning health, safety and environmental legislation. For trade officials, international standards create 'a level playing field' for all competitors in those markets. The existence of divergent national or regional standards can create technical barriers to trade. International standards are the technical means by which political trade agreements can be put into practice.

In developing countries, international standards that represent an international consensus on state of the art development, are an important source of technological know-how. By defining the characteristics that products and services will be expected to meet on export markets, international standards give developing countries a basis for making the right decisions when investing their scarce resources and thus avoid squandering them (ISO, 2008*t*:**Online**).

With regard to consumers, conformity of products and services to international standards provides assurance about their quality, safety and reliability. International standards contribute to the quality of life in general by ensuring that the transport, machinery and tools that are used are safe for everyone. For the planet we inhabit, international standards on air, water and soil quality, on emissions of gases and radiation and environmental aspects of products can contribute to efforts to preserve the environment.

3.8 LABORATORY ACCREDITATION BODIES

3.8.1 The South African Bureau of Standards

"Standards may be thought of as the oil that lubricates the machinery of economic growth and international trade, and are thus essential to international competitiveness" (SABS, 2008*a*:**Online**). Some of the oldest examples of the application of standardization on a large scale is the great pyramids at Giza in Egypt, constructed nearly 5 000 years ago. A 'standard' is a published document, which lists specifications and procedures established to ensure that a material, product, method or service is fit for its purpose and perform in the manner it was intended for. Standards define quality and establish safety criteria for services and products. Conformance to standards ensures good quality and consistency of services and products. In South Africa, standards enhance competitiveness and it provides the basis for consumer protection, health and safety

The South African Bureau of Standards (SABS) is a statutory body that was established in terms of the Standards Act, 1945 (Act No. 24 of 1945) (South Africa, 1945), and continues to operate in terms of the most up-to-date edition of the Standards Act, 1993 (Act No. 29 of 1993) (South Africa, 1993), as the national institution for the endorsement and maintenance of standardization and quality in relation with commodities and the rendering of services in South Africa. These include the following:

- Publishing of national standards, which it prepares through a consensus process in technical committees, providing information on national standards of all countries as well as international standards.
- Testing and certifying products and services to standards.
- Developing technical regulations or compulsory specifications based on national standards as well as monitoring and enforcing compliance with such technical regulations.
- Monitors and enforces legal metrology legislation.
- Promoting design excellence.
- Providing training on aspects of standardisation.

The SABS recently aligned its activities with seven different industry sectors, with a view to maximize its service delivery to the industries it serves (SABS, 2008*b*:**Online**). Each industry sector houses the whole range of SABS services applicable to a particular industry. This alignment ensures easy access to products, faster reaction and turn-around times. The alignment in addition, ensures the creation of centres of knowledge excellence that will be easily available to customers. The seven industry sectors are as follows:

- Chemicals.
- Electrotechnical.
- Food and Health.
- Mechanical and materials.
- Mining and minerals.
- Services.
- Transportation.

The mission of the SABS is, "to offer value-added standardisation services on an ethical and principled basis that uplift the African standard and empower South African industry to compete vigorously towards increased market access. In so doing SABS contributes to the economic growth of South Africa and Africa as a whole within a framework that protects consumers and the environment by promoting uncompromised quality of products and services" (SABS, 2008*c*:**Online**).

3.8.1.1 Accreditations by the SABS

One of the key functions of the SABS, is the endorsement of quality (SABS, 2008*d*:**Online**). For this reason it is crucial that the SABS should submit to even more rigorous assessment and auditing of their own quality systems and competence. The SABS policy states that it should be accredited at least nationally, and where relevant, internationally against the requirements of international standards and guides applicable to the services offered. This statement of the policy is in pursuit of world class service excellence.

Accreditation refers to the procedure by which an authoritative accreditation body, such as the South African National Accreditation System (SANAS), gives formal recognition that a certification body, such as SABS Commercial (Pty) Ltd, is competent to carry out specific tasks (SABS, 2008*d*:**Online**). These tasks include certification of management systems and products, consignment inspection of batches, calibration of equipment and testing of products. Each specific task requires a different set of accreditation requirements. This third party recognition (SABS, 2008*e*:**Online**), allows the recipient of services rendered by the SABS to be confident that the services concerned are being properly performed to international standards. Following this is the outline of the official records of accreditations, both national and international (SABS, 2008*e*:**Online**), which confirms that the SABS is an accredited certification body.

Third Party Recognition (SABS, 2008*e*:**Online**), consists of the following:

- **Certification Services:** Third party recognition of management system certification services, such as for QMS, EMS, OHSAS, and product certification services, such as for the SABS Mark Scheme and BRC, can only be obtained by means of accreditation by an internationally recognised accreditation authority to the requirements of ISO/IEC Guide 62, ISO/IEC Guide 66 or ISO/IEC Guide 65, respectively.
- **Consignment Inspection Services:** Third party recognition of inspection services can only be obtained by means of accreditation by an internationally recognized accreditation authority to the requirements of ISO/IEC 17020, General criteria for the operation of various types of bodies performing inspection.
- **Calibration and Testing Services:** Third party recognition of reliability of test and calibration results can only be obtained by means of accreditation by an internationally recognized accreditation authority to the requirements of ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories.

With respect to international recognition, both the World Trade Organisation (WTO) and the European Union (EU) have taken notice that the lack of acceptance of test results and certification, are the major non-tariff barriers to

trade (SABS, 2008*f*:**Online**). Accreditation of laboratories or inspection bodies and certification bodies, making use of common standards and methods is seen as the most effective way of overcoming these barriers. All major trading countries have established their own independent and internationally credible accreditation bodies. At the top of the world accreditation pyramid is the International Laboratory Accreditation Co-operation (ILAC), and the International Accreditation Forum (IAF) of which SANAS is a full member and is considered in good standing and of sound reputation of both bodies.

The Dutch Accreditation Organisation - Raad voor Accreditatie (RvA) and SANAS are both co-signatories of a Multilateral Agreement and also co-signatories of the EAC agreement. The SABS certification is therefore acknowledged and accepted in all the European countries and all other countries where the RvA has accredited certification bodies (SABS, 2008*f*:**Online**).

SABS Commercial (Pty) Ltd holds the following accreditations (SABS, 2008*f*:**Online**), from the SANAS:

- Certificate number C01 for providing certification of the:
  - Quality Management System (QMS) of an organisation that complies with the requirements of standard ISO 9001:2000.
  - Hazard Analysis Management System (HACCP) of an organisation that complies with the requirements of standard SANS 10330:2006.
- Certificate number C01c for providing certification to standard ISO 22000:2005 Food Safety Management Systems.
- Certificate number C03 for providing certification of the Environmental Management System (EMS) of an organisation that complies with the requirements of standard ISO 14001:2004.
- Certificate number C07a and C07b for providing certification of:
  - Defined goods and products that are manufactured by organisations that comply with the South African National Standards (SANS) technical specifications.
  - Good Agricultural Practices of farms that comply with the requirements.
  - The Food Management System (FMS) of organisations that comply with the requirements of the BRC Global Food standard.

- Certificate number INSP 0003 for providing consignment inspection services to organizations that manufactures Textile, Clothing, Footwear and Leather goods to SANS specified methods and procedures.

For a list of calibration laboratory certificate number and testing laboratory certification numbers, See Annexure A

3.8.1.2 SABS standards

The SABS provide standards that enhance the competitiveness of South Africa, and which are the basis for consumer protection, health, safety and environmental issues (SABS, 2008*h*:**Online**). Furthermore, the SABS has more than fifty years of experience in their core function, which is the development of national standards and the maximization of benefits of the internationalisation of standards. More than 450 technical committees and subcommittees administered by Standards South Africa play a vital role in the process to produce standards. Presently, Standards South Africa maintains approximately 5 000 standards and new standards are developed at a rate of approximately 400 a year.

Standards South Africa in addition identifies, issues and provides information on standards in all seven sectors of industry (SABS, 2008*i*:**Online**). The seven standards departments, which are currently responsible for writing standards are:

- **Chemical and mining standards:** These include dangerous goods, industrial and general chemistry, paints, petroleum, coal, rubber and plastics, and mining standards.
- **Electrotechnical & ICT standards:** These include the wiring code, appliances, information communication technology, physics and electricity distribution.
- **Food and health standards:** These include the many standards relating to food, water, pharmaceuticals, pesticides, medical and health-related topics.
- **Materials standards:** These include covering clothing, textiles, leather and footwear, timber and paper.
- **Mechanical standards:** These include vessels under pressure, above-ground storage of petroleum products, paraffin stoves, and standards covering civil

engineering (i.e. construction procurement and the National Building Regulations).

- **Services standards:** These include those systems standards concerned with quality management, environmental management, and other generic management systems standards.
- **Transportation standards:** These include vehicles, buses, lifting equipment and other aspects of transportation.

The SABS can develop private specifications, if they are required by private organisations or government departments (SABS, 2008*i*:**Online**). The SABS have a research and development section, which undertakes research into standards-related topics. Liaison is maintained with international (e.g. ISO, IEC and UN-ECE), and regional (i.e. SADCSTAN) South African Development Community Cooperation in Standardisation bodies.

The following are the specialised standards information and sales services (SABS, 2008*j*:**Online**), offered by the SABS:

- Official WTO/TBT (World Trade Organisation/Technical Barriers to Trade) enquiry point for South Africa.
- Information on all local, foreign and international standards.
- A subscription service for collections of national standards.
- A notification service for updating collections of international and foreign standards.
- Referrals to experts.
- Sales of national, international and foreign standards.
- A CD-ROM-on-request service, including value-added features such as search facilities and hypertext links.
- A technical library that provides information on technical and standards-related matters.
- Training on standards sales and standards information matters.

3.8.1.3 Standard bodies

The International Standard bodies (SABS, 2008*f*:**Online**), consist of the following:

- The International Electro technical Commission (IEC).
- The International Organization for Standardization (ISO).
- The International Telecommunication Union (ITU).
- The American Society for Testing and Materials (ASTM).
- The World Standards Services Network (WSSN).

The WSSN is a public network that is accessible to World Wide Web servers of standards organizations around the world. The WSSN provides information on international, regional and national standardization and related activities and services to the websites of its members. Furthermore the WSSN provide direct links from these sites.

The Regional Standard bodies (SABS, 2008*l*:**Online**) consist of the following:

- The European Broadcasting Union (EBU).The European
- Telecommunications Standards Institute (ETSI).
- The European Committee for Standardization (CEN).
- The European Committee for Electrotechnical Standardization (CENELEC).
- The UN Economic Commission for Europe (UN/ECE).
- The Southern African Development Community Cooperation in Standardisation (SADCSTAN).

3.8.2 The International Laboratory Accreditation Cooperation

The ILAC is an international cooperation of laboratory and inspection accreditation bodies. The cooperation was formed in the 1970's to help remove technical barriers to trade. Accreditation of laboratories demonstrates competence, impartiality and capability, and allows people to make an informed decision when selecting a laboratory for service delivery. Accreditations helps to underpin the credibility and performance of goods and services as well (ILAC, 2008*a*:**Online**).

In terms of ILAC, accreditation bodies globally, which have been assessed by their peers as competent, have signed an arrangement that augments the acceptance of products and services across national borders (ILAC, 2008*b*:**Online**). The purpose of the ILAC Arrangement is to form an international framework to support international trade by means of the removal of technical

barriers. ILAC represent more than 70 economies and regional organisations, which include its member's laboratory and inspection accreditation bodies. The crucial aim of the ILAC Arrangement is the increased use and acceptance of the results from accredited laboratories and inspection bodies, including results from laboratories in other countries by industry as well as regulators. Thus the free trade aspiration of 'product tested once and accepted everywhere'. The ILAC facilitate a focus on:

- Developing and harmonising laboratory and inspection accreditation practices.
- Promoting laboratory and inspection accreditation to industry, governments, regulators and consumers.
- Assisting and supporting developing accreditation systems.
- Global recognition of laboratories and inspection facilities via the ILAC Arrangement, thus facilitating acceptance of test, inspection and calibration data accompanying goods across national borders.

3.8.2.1 The concept of ILAC

ILAC first started as a conference in 1977. The aim of the conference was the development of an international cooperation for facilitating trade by promotion of the acceptance of accredited test and calibration results (ILAC, 2008*b*:**Online**). The ILAC became a formal cooperation in 1996 with a mission to establish a network of mutual recognition agreements among accreditation bodies that would fulfil this aim. The ILAC Arrangement culminates 22 years of intensive work. On the 2nd of November 2000, 36 laboratory accreditation bodies who are full members of the ILAC, from 28 economies worldwide signed an 'arrangement' in Washington, DC to encourage the acceptance of technical test and calibration data for exported goods.

On the 31st of January 2001, the 'ILAC Arrangement' came into effect (ILAC, 2008*b*:**Online**). This arrangement provides significant technical underpinning to international trade. Developing global network of accredited testing and calibration laboratories that are assessed and recognised as being competent by ILAC Arrangement signatory accreditation bodies, is the key to the arrangement.

The signatories have been peer-reviewed and have met the criteria for competence of the ILAC. Governments can take advantage to further develop or enhance trade agreements, now that the ILAC Arrangement is in place. The ultimate aim is enhancing the use and acceptance by industry as well as government of the results from accredited laboratories, which include results from laboratories in other countries. The vital free trade goal of 'product tested once and accepted everywhere' can as a result be realised (ILAC, 2008*b*:**Online**).

The aim of the ILAC Arrangement is to develop a global network of accredited testing, calibration and inspection facilities that can be depended on to provide accurate results and data (ILAC, 2008*c*:**Online**). The ILAC Arrangement provides technical underpinning to international trade. This is accomplished by promoting cross-border stakeholder confidence and acceptance of accredited laboratory results and data. Before the development of the ILAC Arrangement, there had been no multi-lateral mutual recognition agreement in laboratory accreditation. The ILAC Arrangement now eliminates the hindrance for some types of international trade, particularly those products which have had to undergo re-testing or re-calibration upon entry to importing countries

The main elements for establishing assurance amongst the participating systems within ILAC are outlined below (ILAC, 2008*c*:**Online**). With the intention of establishing and maintaining mutual confidence in the technical competence of ILAC members and their accredited laboratories, these elements were designed to guarantee conformance with the requirements. The main elements referred to above, include:

- Exchange of information on the development and operation of ILAC member accreditation schemes.
- Participation in the work and decision-making of the ILAC General Assembly and ILAC Committees where applicable.
- Participation in international inter-laboratory comparisons and proficiency testing programs.
- Participation in the work of ILAC Expert Groups and Task Forces held to discuss problems related to testing and calibration in various technical fields.

- Evaluations of applicants and re-evaluations of signatories to this Arrangement are conducted in accordance with the relevant ILAC and regional cooperation documents.
- Observations of applicant bodies' and signatories' assessments of their laboratories to determine if these laboratories meet the requirements of the current version of ISO/IEC 17025 or ISO 15189 (for medical testing laboratories).
- Confidence in the metrology institutes of the signatory economies to which traceability is claimed by accredited laboratories and support for the measurement comparison activities of the International Bureau of Weights and Measures (BIPM) and/or regional metrology organizations.

3.8.2.2 The ILAC Arrangement

ILAC (ILAC, 2008*d*:**Online**), describes that this arrangement is based on the outcomes of an intensive assessment of each body approved by peers and in accordance with the relevant rules and procedures contained in several of the ILAC publications. All accreditation bodies signatory to the arrangement agrees to abide by its terms and conditions and by the ILAC assessment procedures and must:

- Maintain conformance with the current version of ISO/IEC 17011, related ILAC guidance documents, and a few, but important, supplementary requirements, and
- Ensure that all accredited laboratories comply with ISO/IEC 17025 (for testing and calibration laboratories) or ISO 15189 (for medical testing laboratories) and related ILAC policy and guidance documents.

The ILAC Arrangement builds upon existing or developing regional arrangements established globally (ILAC, 2008*d*:**Online**). The participating bodies in these regional arrangements are accountable for maintaining the essential confidence in accreditation bodies from their region that are signatories to the ILAC Arrangement. All recognized Regional Cooperation Body must adhere to the procedures defined in the ILAC requirements documents. The current ILAC-recognised regions with acceptable Mutual Recognition Arrangements (MRAs) and assessment procedures are the European Cooperation for Accreditation

(EA), the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and the Inter-American Accreditation Cooperation (IAAC). Before requesting recognition and approval by ILAC, the Southern African Development Community in Accreditation (SADCA) is presently developing their MRA assessment processes. Regions being developed in other parts of the world are in their infancy. Having recently joined ILAC with one such region, is the Central Asian Cooperation on Metrology Accreditation and Quality (CAC-MAS-Q). Accreditation bodies that cannot be associated with a recognised region may well apply directly to ILAC for evaluation or assessment and recognition.

The evaluation or assessment of an accreditation body to establish its qualifications to be a signatory involves a team of peers which generally consists of senior staff of experienced accreditation bodies (ILAC, 2008*d*:**Online**). These evaluations include the time spent at the headquarters office of the applicant body to determine compliance with ISO/IEC 17011. Furthermore, the evaluators or auditors witness the performance of the applicant's assessors during the actual assessments or reassessments to determine if the laboratories are in compliance with the ISO/IEC 17025 for testing and calibration laboratories, or ISO 15189 standard for medical testing laboratories, and that there is sufficient in depth examination to determine whether the laboratory is competent.

The signatories agrees to notify each other about any major changes in the status or operation of the accreditation body in order to maintain the value and significance of the ILAC Arrangement (ILAC, 2008*e*:**Online**). Issues of significance will include the following:

- Changes in name or legal/corporate status.
- New agreements negotiated with other accreditation bodies or the revision. suspension or termination of any such agreements.
- Changes in key senior staff or the organisational structure.
- Significant changes in the operations of the body.

In order to afford a consistent channel of communication between the accreditation bodies, each signatory to the ILAC Arrangement must in addition designate a liaison officer.

Now that the ILAC Arrangement is in place, the next crucial step is for governments and industries to take advantage of this arrangement (ILAC, 2008*e*:**Online**). Governments can make use of it to further develop or enhance trade agreements. An additional vital step that is already in progress involves government acceptance of the results from accredited laboratories. The acceptance of test results by regulatory agencies around the world from testing and calibration laboratories that are accredited by accreditation bodies, which are signatories to the ILAC Arrangement, without direct government review, including results from laboratories in other countries are already underway.

Many indicators like government agencies have come to value the importance of credible accreditation programs that are based on internationally recognised standards. Due to restricted budgets, many Government agencies can no longer do it all themselves. Increasingly government agencies must rely on third party laboratories to support their regulatory efforts. When they make use of these third party laboratories, they need a fair and meaningful basis for identifying qualified service providers. Accreditation and the ILAC Arrangement provides a means for recognition of acceptable accreditation bodies (ILAC, 2008*e*:**Online**).

Industry users of test and calibration data likewise can take advantage of the ILAC Arrangement (ILAC, 2008*e*:**Online**). These users will have greater confidence in the accuracy of the test or calibration report that they are purchasing. This in particular if industry users are conscious of the scope of the laboratory accreditation, as it has been generated by a competent facility. Manufacturers in addition gain efficiency because of accreditation. Instead of using their own on-site assessments, industry users can defer to the assessments of competent accreditation authorities that are ILAC Arrangement signatories (ILAC, 2008*e*:**Online**).

Due to the ILAC Arrangement, confidence is built amongst accreditation bodies and their ability to determine a laboratory's competence to perform testing or calibrations. This confidence smoothes the progress of the acceptance of testing and calibration results between countries when the results can be confirmed to come from an accredited laboratory. Furthermore, this helps to reduce some technical barriers to trade. Through the ILAC Arrangement, the foundation for

realising the ideal of having products 'tested once and accepted everywhere' has been established (ILAC (2008*e*:**Online**).

3.8.3 The Laboratory Accreditation Bureau (L-A-B)

The L-A-B (L-A-B, 2008*a*:**Online**), is a recognised accreditation body, who dedicate itself to continually:

- Provide services to satisfy the needs of the clients.
- Improving the quality of laboratories and the services they provide.
- Increasing the acceptance of accredited laboratories worldwide.
- Complying with ISO/IEC 17011.

The L-A-B is a Michigan based corporation established to provide laboratory accreditation services to independent testing and calibration laboratories throughout North America (L-A-B, 2008*b*:**Online**). The L-A-B conforms to ISO/IEC 17011 in assessing and accrediting laboratories test and calibration laboratories to ISO/IEC 17025.

The L-A-B was founded based on one unyielding goal, that is to provide testing and calibration laboratories with superior accreditation services (L-A-B, 2008*c*:**Online**). This task is executed by a team of qualified assessors, with timely response, a top priority. The L-A-B is fully aware that many laboratories are subject to time-sensitive mandates and strives to schedule and conduct assessments to suit the customer timetables. To process reports and issue certificates with minimal delay is the goal of the L-A-B. In order to provide the best combination of functional and relational skills, assessor selection criteria include experience, overall qualifications, communication or interpersonal competence and geographic representation.

The global harmonisation of national and industry-specific standards is on an incline (L-A-B, 2008*c*:**Online**). This implies that in future suppliers will compete with compliance to fewer, more consistent and more extensively recognised standards. These requirements will expand vastly into the supply chain, impacting on companies that formerly were excluded from having to meet formal requirements.

Effective from December 6, 2007 the L-A-B is a signatory to the Asia Pacific Laboratory Accreditation Cooperation (APLAC) Mutual Recognition Arrangement (MRA) (L-A-B, 2008*d*:**Online**). The L-A-B now advances to be a full member of the ILAC. As a result, the L-A-B will recognize, and be fully recognized by the 58 ILAC signatories internationally.

The USA automotive industry has provided acceptance of the L-A-B as an accreditation body suitable for the purpose of demonstrating conformance of laboratories to the requirements within the QS-9000 standard (L-A-B, 2008*d*:**Online**). North American automakers require their QS-9000/TS-16949 registered suppliers to make use of accredited independent testing or calibration laboratories to evaluate the compliance to ISO/IEC 17025. The requirements are applicable to direct suppliers to the auto manufacturers and to the subcontracted testing and calibration laboratories used by their suppliers. For these laboratories L-A-B, is a recognized accreditation body. Furthermore, the L-A-B has achieved full recognition through NACLA (National Cooperation for Laboratory Accreditation) for testing and calibration laboratory accreditation. Additional authority of the L-A-B is by virtue of the acceptance of L-A-B accredited laboratories and the data and services they provide (L-A-B, 2008*d*:**Online**).

The L-A-B was established to provide ISO/IEC 17025 laboratory accreditation services to independent and captive, testing and calibration laboratories. L-A-B is accredited to ISO/IEC 17011, for assessing laboratories to ISO/IEC 17025 (L-A-B, 2008*e*:**Online**).

On December 5, 2007 the Asia Pacific Laboratory Accreditation Cooperation (APLAC) MRA Council voted to accept the L-A-B into the APLAC MRA for calibration and testing (L-A-B, 2008*b*:**Online**). The L-A-B now being a signatory to the APLAC MRA automatically advances its associate status in ILAC to full member status and in addition, is now a signatory to the ILAC arrangement. The APLAC and its evaluation team have volunteered their time to advance laboratory accreditations, worldwide.

3.8.3.1 Multi-site Laboratory Accreditation

Where more than one permanent location is included in a single accreditation granted to a laboratory, the L-A-B make use of Multi-site accreditations (L-A-B, 2008*g*:**Online**). Companies offering calibration services from technicians individually located in their location are 'multi-site' laboratories. These laboratories seeking multi-site accreditation must distinctively apply for it. All locations of the laboratory seeking accreditation must utilize the same quality system and quality manual, which must comply with the requirements of ISO/IEC 17025. One corporate contact is allocated for these laboratories.

3.8.3.2 The requirements for Multi-site Laboratories

Multi-site Laboratories must document fully the relationships between the locations and the extent of interaction for example the allocation of testing or calibration work, transfer of samples between locations, movement of technical staff and or equipment and centralised or otherwise rationalised reporting arrangements (L-A-B, 2008*h*:**Online**). The extent of interaction possible will depend among other factors, on the commonality of test or calibration and or sampling methods and of quality control of performance. The laboratories must have mechanisms in place to assure that inquiries about work in progress are handled efficiently, regardless of any transfer between locations.

The laboratories must assure that reviews of requests, tenders and contracts include appropriate consideration of customers, or that potential customers are aware of the multi-site accreditation status and the implications of this for work undertaken.

3.8.3.3 Defining the scope for Multi-site Laboratories

The L-A-B defines the scopes of multi-site accreditation for laboratory accredited sites, each scope has to be separate and appropriate for the technical competence for that particular site (L-A-B, 2008*i*:**Online**) . This is necessary for the clients of organizations performing testing and or calibration and also for the purposes of L-A-B assessments. Each location involved in the provision of accredited testing or

calibration activities, or in providing support functions to those activities, has to be identified with separate scopes. The scopes issued by L-A-B state clearly that a multi-site accreditation is involved via the numbering system for each scope. The entire scope is detailed of testing or calibration and or sampling, whether performed in a permanent laboratory or on site. The scope furthermore lists the locations involved together with the general activities and or support functions carried at or by each laboratory. The L-A-B furnishes each site with a separate certificate of accreditation with a distinct suffix number. In the same way, separate scopes for multi-site accreditation will be issued for each site when separate certificates are issued.

3.8.3.4 The assessment and accreditation processes for Multi-site Laboratories

The normal assessment and accreditation processes for laboratory accreditation apply to multi-site accreditation (L-A-B, 2008*j*:**Online**). Each of the sites is considered an individual assessment to ensure compliance to ISO / IEC 17025 and their own quality system. All locations, key activities and individuals must be reviewed to assure technical competence at the initial assessment. The entire proposed scope is covered with the appropriate technical evaluation through a series of observations, procedural review, interviews, and detailed equipment evaluation.

During these assessments, the activities throughout the multi-site organization will be covered during the examination and renewal assessments to the degree necessary to form a reliable conclusion about compliance with ISO/IEC 17025. A minimum requirement is that at least once in the three year assessment cycle, it is expected that all locations or individuals would be visited or personally interviewed. When an assessment involves sampling of individual sites, before the assessment is conducted the assessor and laboratory must agree to a sampling plan that must be approved by the L-A-B. The sampling plan must be documented based on excellent statistical practice, and it must ensure that a sufficient number of sites and technical personnel are sampled to provide a firm basis for judgments of competence for the organisation as a whole (L-A-B, 2008*j*:**Online**).

A technical evaluation may constitute an evaluation at a central location, particularly if the calibration and or test can be performed without the requirement of technical competence of the particular laboratory environment. This would not constitute a key activity for accreditation. In addition, a representative number of technicians must be witnessed performing calibrations and or testing to further that confidence for accreditation. In some instances, it may be feasible to have the various technicians and their equipment, procedures and other requisite documentation brought to one central location. In such an instance, the assessors may interview each of the technicians involved in the multi-site accreditation. If not, the assessor will have to visit each of the individuals involved in the multi-site accreditation to ensure that they have the appropriate equipment, training, and documentation (L-A-B, 2008*j*:**Online**).

An accredited multi-site organisation must notify the L-A-B of any changes of individuals or locations to the accreditation. An additional visit may have to be scheduled to confirm continued conformance with ISO/IEC 17025 and the requirements of the L-A-B depending on the significance of the change. In all instances, accreditation of calibration services offered by a number of individuals located in various parts of the country, or even internationally, is a complex undertaking. Generally, it involves significant time and effort on the part of the assessor to assure that each of the individuals included in the assessment and subsequent accreditation is competent (L-A-B, 2008*j*:**Online**).

3.9 CONCLUSION

In this chapter a literature review was conducted on the primary theme of the dissertation, namely that of the SANAS accreditation for the CPUT TSCT testing laboratory. Furthermore, the ISO in terms of structure, development, importance, significance and benefits was elaborated upon in detail. In addition, to place the accreditation in perspective of the overall research, laboratory accreditation bodies, namely the SABS, the ILAC and the L-A-B was analysed in detail. In the next chapter, the data collection design and methodology will be discussed in detail.

CHAPTER 4: DATA COLLECTION DESIGN AND METHODOLOGY

4.1 THE SURVEY ENVIRONMENT

The CPUT is situated in Cape Town, South Africa. The institution comprises of six faculties, namely:

- The faculty of Engineering.
- The faculty of Health & Wellness Sciences.
- The faculty of Informatics & Design.
- The faculty of Education & Social Sciences.
- The faculty of Business.
- The faculty of Applied Sciences.

For the purpose of clarity to accurately determine the research environment, the following paragraph is verbatim repeated from Paragraph 1.1, Chapter1:The Department of Clothing and Textile Technology forms part of the Engineering faculty of the CPUT. In this department, there are two educational programs, namely that of Clothing Management and Textile Technology. The TSCT forms part of the department of Clothing and Textile Technology. The TSCT comprises of a textile testing laboratory, which will serve as the research environment.

4.2 AIM OF THIS CHAPTER

The aim of this chapter and the survey contained therein is to determine what the key factors are for obtaining SANAS accreditation for the TSCT testing laboratory. The ultimate objective being to solve the research problem as defined in Chapter 1, Paragraph 1.3, and which reads as follows:

"Industry demands that the CPUT TSCT testing laboratory obtain SANAS accreditation".

4.3 CHOICE OF SAMPLING METHOD

According to Collis and Hussy (2003:155-160), a sample is made up of the members of a 'population' (the target population), the latter referring to a body of

people or to any other collection of items under consideration for the purpose of the research. A 'sample frame' in turn refers to a list or any other record of the population from which all the sampling units are drawn, for example in a large company, one can have a list of all the employees and this list will form the 'sample frame' from which one can take a 'sample'. Two main categories of sampling can be identified namely 'probability sampling' (where the researcher can in advance determine that each segment of the population will be represented in the sample, and 'nonprobability sampling' (where the researcher has no way of forecasting or guaranteeing that each element of the population will be represented in the sample). Three of the more popular methods of probability sampling which can be used to select a sample, are random sampling, systematic sampling and stratified sampling. Random sampling was selected as the sampling method in this dissertation.

4.4 THE TARGET POPULATION

With any survey, it is necessary to clearly define the target population, which Collis & Hussey (2003:155), define as follows:

> *"A population is any precisely defined set of people or collection of items which is under consideration".*

The CPUT TSCT testing laboratory processes will serve as the unit of analysis in this dissertation. The CPUT Clothing and Textile Technology department will serve as the sampling frame, while the sample selected will lie on the basis of probability sampling, using random sampling. Questionnaires will serve as data collection methodology for this research.

The 'sampling frame' defined by Vogt (1993:202), as 'a list or record of the population from which all the sampling units are drawn. For this survey, 100 questionnaires will be distributed to randomly selected employees, students and industry testing customers, who specifically make use of the TSCT testing laboratory. The employees include all lecturers, technicians, administration and support staff who are directly involved with the operations of the TSCT testing laboratory. The students include all academic and research students who make use of the laboratory facilities. The industry testing customers include all clothing and

textile and related companies who make use of the laboratories testing services on a daily basis.

4.5 DATA COLLECTION

According to Mouton (2001:105), there are various types of data collection methods, namely:

- **Observation:** Experimental recordings, systematic field observations and participant observation.
- **Interviewing:** Structured self administered questionnaires, structured telephone interviews, semi-structured focus group interviewing and free attitude interviewing methods.
- **Testing:** Physical, psychological or psychometric testing.
- **Selecting and analysing texts:** Textual analysis (content analysis, textual criticism, textual exegesis), disclose analysis, conversion analysis, semiotic analysis and ethnomethodology and historical or narrative analysis.

The primary data collection method used in this survey is interviewing using structured self-administered questionnaires.

4.6 MEASUREMENT SCALES

The survey will be based on the well-known Lickert scale, whereby respondents were asked to respond to questions or statements (Parasuraman 1991:410). The reason for choosing the Lickert scale, the fact that the scale can be used in both respondent-centred (how responses differ between people) and stimulus-centred (how responses differ between various stimuli) studies, most appropriate to glean data in support of the research problem in question (Emory and Cooper 1995:180-181). The advantages in using the popular Lickert scale according to Emory and Cooper (Emory and Cooper 1995:180-181) are:

- Easy and quick to construct.
- Each item meets an empirical test for discriminating ability.
- The Lickert scale is probably more reliable than the Thurston scale, and it provides a greater volume of data than the Thurston differential scale.
- The Lickert scale is also treated as an interval scale.

According to Remenyi, Money and Twite (1995:224), interval scales facilitate meaningful statistics when calculating means, standard deviation and Pearson correlation coefficients.

4.7 THE DEMAND FOR A QUALITATIVE RESEARCH STRATEGY

While this author acknowledges that a number of strategies can be applied in similar research projects, the well-known concepts of objectivity, reliability etcetera, inherited from the empirical analytical paradigm, is suggested for business research in more or less the traditional way. These concepts are defined by Emory & Cooper (1995:156), as follows:

- **Practicality:** Practicality is concerned with a wide range of factors of economy, convenience, and interpretability.
- **Validity:** Validity refers to the extent to which a test measures what we actually wish to measure. Yin (1994:18), identifies 3 subsets to the concept validity, namely: Construct validity, internal validity and external validity.
- **Reliability:** Reliability has to do with the accuracy and precision of a measurement procedure.

4.8 SURVEY DESIGN

Collis and Hussey (2003:60), is of the opinion that, 'if research is to be conducted in an efficient manner and make the best of opportunities and resources available, it must be organised. Furthermore, if it is to provide a coherent and logical route to a reliable outcome, it must be conducted systematically using appropriate methods to collect and analyse the data. A survey should be designed in accordance with the following stages:

- **Stage one:** Identify the topic and set some objectives.
- **Stage two:** Pilot a questionnaire to find out what people know and what they see as the important issues.
- **Stage three:** List the areas of information needed and refine the objectives.
- **Stage four:** Review the responses to the pilot.
- **Stage five:** Finalise the objectives.
- **Stage six:** Write the questionnaire.
- **Stage seven:** Re-pilot the questionnaire.

- **Stage eight:** Finalise the questionnaire.
- **Stage nine:** Code the questionnaire.

The survey design to be used in this instance is that of the descriptive survey as opposed to the analytical survey. The descriptive survey is according to Collis and Hussey (2003:60), frequently used in business research in the form of attitude surveys. The descriptive survey as defined by Ghauri, Grønhaug and Kristianslund (1995:60), has furthermore the characteristics to indicate how many members of a particular population have a certain characteristic.

The statements within the survey have been designed with the following principles in mind:

- Avoidance of double-barrelled statements.
- Avoidance of double-negative statements.
- Avoidance of prestige bias.
- Avoidance of leading statements.
- Avoidance of the assumption of prior knowledge.

Statements were so formulated as to allow the same respondents to respond to each of the two questionnaires, to determine if a paradigm shift will occur after the laboratory will be SANAS accredited.

4.9 THE VALIDATION SURVEY QUESTIONS

The questions for the survey were prepared and piloted to ensure they reflected a high degree of 'validity' (Easterby-Smith, Thorpe & Lowe (1996:40). A list of the survey questions are elaborated upon below:

4.9.1 Textile Testing Laboratory Questionnaire

Question A: What type of laboratory user are you?

Question B: For what purpose do you use the laboratory?

Question 1: I often make use of the laboratory.

Question 2: The use of the laboratory facilitates industry problem solving.

Question 3: The use of the laboratory assists me to understand the work covered in theory.

Question 4: The equipment in the laboratory is sufficient to cover my testing and practical needs.

Question 5: The consumables in the laboratory are sufficient to cover my testing and practical needs.

Question 6: The laboratory has sufficient test methods to cover my testing and practical needs.

Question 7: I often make use of performance standards offered by the laboratory.

Question 8: Students adhere to laboratory rules and instructions from lecturers and technicians.

Question 9: The services offered by the laboratory are of a high standard.

Question 10: The laboratory has a system in place for scheduling incoming customer required tests.

Question 11: The laboratory has a system in place for scheduling practical assignments.

Question 12: The laboratory is very effective in terms of testing service delivery.

Question 13: It is of importance that the laboratory seeks accreditation by the South African National Accreditation System (SANAS) body.

Question 14: In terms of SANAS accreditation requirements, the laboratory already meets most of the set requirements.

Question 15: My company will benefit greatly if the laboratory obtains this kind of accreditation.

Question 16: I am aware of the fact that some of the laboratory's test methods are certified by the Council for Scientific and Industrial Research (CSIR).

Question 17: This CSIR certification is considered an important aspect of my company.

Question 18: SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.

4.10 CONCLUSION

In this chapter, detail was provided of the survey design pertaining to the survey to be undertaken among randomly selected respondents of the TSCT testing laboratory. In the next chapter, data gleaned from the survey will be analysed and interpreted using descriptive and inferential statistics.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION OF RESULTS

5.1 INTRODUCTION

This chapter discusses the statistical analysis of a survey conducted at the TSCT testing laboratory of the CPUT in order to determine whether laboratory is, subject to a forced intervention to attain SANAS accreditation, and if it meets the set requirements for accreditation. The information obtained from the questionnaires posed to the respondents will be presented and analysed in this chapter.

To serve the purpose of this research, descriptive and inferential statistics were used to analyse the data. The data has been analysed by using SAS software. As descriptive statistics, frequency tables displayed in Paragraph 5.3 shows the distributions of statement responses.

5.2 ANALYSIS METHOD

5.2.1 Validation survey results

A descriptive analysis of the study results are reflected below. The distribution of all variables is indicated in table format for ease of reference. Each variable is tested to fall within the set boundaries.

5.2.2 Data format

The data was provided in its original questionnaire format. A database in Micro Soft Access was developed and the questionnaires were captured in the database. It was then imported into SAS-format through the SAS ACCESS module. This information was subsequently analysed and reflected in this chapter.

5.2.3 Preliminary analysis

Descriptive statistics (Uni-variate analysis) were used to establish the frequency, range, mean and standard deviation of the statements. The table which contains the frequencies, percentages, cumulative frequencies and cumulative percentages

are shown in Paragraph 5.3.1 with the detailed analysis contained within the ambit of Annexure B.

5.2.4 Inferential statistics

The following inferential statistics were performed on the data:

- Reliability analysis (Cronbach's alpha coefficient to determine consistency). Alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from dichotomous (that is, questions with two possible answers) and / or multi-point formatted questionnaires or scales (i.e., rating scale: 1=poor, 5=excellent). The higher the score, the more reliable the generated scale is.
- The chi-square tests for equal proportions were performed on the statements to indicate whether one choice was preferred above another.
- Due to the fact that the above mentioned variables (type of laboratory user and purpose of use) are not mutually exclusive, a comparison between the different types of laboratory user and purpose of use with respect to responses, could not be made. As a result, the analysis will focus on the total sample's outcome and mostly on descriptive statistics.

5.2.5 Assistance to researcher

The conclusions made in this chapter are validated by the statistical report. The interpretation of the statistics was validated and checked by a qualified statistician, to exclude any misleading interpretations.

5.2.6 Sample

The target population was the CPUT Clothing and Textile Technology department. A random sample of 100 employees, students and industry testing customers was drawn from this department.

5.3 ANALYSIS

Of the total number of respondents (100) who were randomly selected, only 56 responded to the questionnaires. All the statements used a 5 point Likert scale as response method, facilitating the use of an ordinal scale and descriptive and

inferential statistics for continuous data to be used. The sample is described by the two variables indicating 'what type of user the respondents are' and 'what purpose the laboratory is used for'.

5.3.1 Descriptive statistics

In Table 5.1 the descriptive statistics for all the responses on the statements are presented for the managers and students separately. It shows the frequencies in each category and the percentage out of total sample. It is of importance to note that the descriptive statistics are based on the total sample, where the inferential statistics will be based on non missing information. In some cases the respondents did not indicate their response on a statement. These non responses are also included and are indicated as the "unknown" category.

TABLE 5. 1: Descriptive statistics of responses to statements

Variables	Categories	Frequency	Percentage out of total
Classification			
1A Type of laboratory user - Lecturer	Yes	4	7.1%
	No	52	92.9%
2A Type of laboratory user – Student	Yes	35	62.5%
	No	21	37.5%
3A Type of laboratory user – Assistant	Yes	2	3.6%
	No	54	96.4%
4A Type of laboratory user – Other Staff	Yes	0	0.0%
	No	56	100.0%
5A Type of laboratory user – Testing customer	Yes	15	26.8%
	No	41	73.2%
1B Purpose of using laboratory – Lecturing	Yes	6	10.7%
	No	50	89.3%
2B Type of laboratory user – Learning	Yes	25	44.6%
	No	31	55.4%
3B Type of laboratory user – Practical	Yes	31	55.4%
	No	14	44.6%
4B Type of laboratory user – Research	Yes	8	14.3%
	No	48	85.7%

Variables	Categories	Frequency	Percentage out of total
5B Type of laboratory user – Testing Services	Yes	19	33.9%
	No	37	66.1%
Statements			
1. I often make use of the laboratory.	Strongly agree	10	17.9%
	Agree	22	39.3%
	Undecided	6	10.7%
	Disagree	17	30.4%
	Strongly disagree	1	1.8%
2. The use of the laboratory facilitates industry problem solving.	Strongly agree	19	33.9%
	Agree	31	55.4%
	Undecided	3	5.4%
	Disagree	3	5.4%
3. The use of the laboratory assists me to understand the work covered in theory.	Strongly agree	25	44.6%
	Agree	20	35.7%
	Undecided	7	12.5%
	Disagree	2	3.6%
	Strongly disagree	2	3.6%
4. The equipment in the laboratory is sufficient to cover my testing and practical needs.	Strongly agree	29	51.8%
	Agree	20	35.7%
	Undecided	3	5.4%
	Disagree	3	5.4%
	Unknown	1	1.8%
5. The consumables in the laboratory are sufficient to cover my testing and practical needs.	Strongly agree	18	32.1%
	Agree	27	48.2%
	Undecided	10	17.9%
	Disagree	1	1.8%
6. The laboratory has sufficient test methods to cover my testing and practical needs.	Strongly agree	22	39.3%
	Agree	27	48.2%
	Undecided	4	7.1%
	Disagree	3	5.4%
7. I often make use of performance standards offered by the laboratory.	Strongly agree	9	16.1%
	Agree	16	28.3%
	Undecided	19	33.9%

Variables	Categories	Frequency	Percentage out of total
	Disagree	7	12.5%
	Strongly disagree	4	7.1%
	Unknown	1	1.8%
8. Students adhere to laboratory rules and instructions from lecturers and technicians.	Strongly agree	12	21.4%
	Agree	25	44.6%
	Undecided	17	30.4%
	Disagree	0	0.0%
	Strongly disagree	1	1.8%
	Unknown	1	1.8%
9. The services offered by the laboratory are of high standard.	Strongly agree	16	28.6%
	Agree	30	53.6%
	Undecided	4	7.1%
	Disagree	3	5.4%
	Strongly disagree	1	1.8%
	Unknown	2	3.6%
10. The laboratory has a system in place for scheduling incoming customer required tests.	Strongly agree	15	26.8%
	Agree	22	39.3%
	Undecided	14	25.0%
	Disagree	4	7.1%
	Unknown	1	1.8%
11. The laboratory has a system in place for scheduling practical assignments.	Strongly agree	12	21.4%
	Agree	28	50.0%
	Undecided	13	23.2%
	Disagree	1	1.8%
	Unknown	2	3.6%
12. The laboratory is very effective in terms of testing service delivery.	Strongly agree	19	33.9%
	Agree	23	41.1%
	Undecided	10	17.9%
	Disagree	2	3.6%
	Strongly disagree	1	1.8%
	Unknown	1	1.8%
13. It is of importance that the laboratory seeks accreditation by the SANAS	Strongly agree	25	44.6%
	Agree	24	42.9%

Variables	Categories	Frequency	Percentage out of total
body.	Undecided	5	8.9%
	Unknown	2	3.6%
14. In terms of SANAS accreditation requirements, the laboratory already meets most of the set requirements.	Strongly agree	12	21.4%
	Agree	15	26.8%
	Undecided	21	37.5%
	Disagree	3	5.4%
	Strongly disagree	1	1.8%
	Unknown	4	7.1%
15. My company will benefit greatly if the laboratory's test methods are certified by the CSIR.	Strongly agree	21	37.5%
	Agree	25	44.6%
	Undecided	9	16.1%
	Unknown	1	1.8%
16. I am aware of the fact that some of the laboratory's test methods are certified by the CSIR.	Strongly agree	12	21.4%
	Agree	23	41.1%
	Undecided	17	30.4%
	Disagree	3	5.4%
	Unknown	1	1.8%
17. This CSIR certification is considered an important aspect of my company.	Strongly agree	14	25.0%
	Agree	20	35.7%
	Undecided	17	30.4%
	Disagree	3	5.4%
	Unknown	2	3.6%
18. SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.	Strongly agree	19	33.9%
	Agree	25	44.6%
	Undecided	10	17.9%
	Unknown	2	3.6%

TABLE 5. 2: Descriptive statistics for ordinal variables

Variable	N	Mean	Standard Deviation	Range
1. I often make use of the laboratory.	51	2.47	1.1019	4

2. The use of the laboratory facilitates industry problem solving.	51	1.84	0.7842	4
3. The use of the laboratory assists me to understand the work covered in theory.	51	1.90	1.0441	5
4. The equipment in the laboratory is sufficient to cover my testing and practical needs.	51	1.65	0.8444	4
5. The consumables in the laboratory are sufficient to cover my testing and practical needs.	51	1.90	0.7551	4
6. The laboratory has sufficient test methods to cover my testing and practical needs.	51	1.74	0.7441	4
7. I often make use of performance standards offered by the laboratory.	51	2.53	1.0460	5
8. Students adhere to laboratory rules and instructions from lecturers and technicians.	51	2.16	0.8573	5
9. The services offered by the laboratory are of high standard.	51	1.90	0.8545	5
10. The laboratory has a system in place for scheduling incoming customer required tests.	51	2.12	0.9305	4
11. The laboratory has a system in place for scheduling practical assignments.	51	2.06	0.7593	4
12. The laboratory is very effective in terms of testing service delivery.	51	1.96	0.9372	5
13. It is of importance that the laboratory seeks accreditation by the SANAS body.	51	1.65	0.6580	3
14. In terms of SANAS accreditation requirements, the laboratory already meets most of the set requirements.	51	2.37	0.9584	5
15. My company will benefit greatly if the laboratory's test methods are certified by the CSIR.	51	1.78	0.7018	3
16. I am aware of the fact that some of the laboratory's test methods are certified by the CSIR.	51	2.16	0.8573	4
17. This CSIR certification is considered an important aspect of my company.	51	2.18	0.8878	4
18. SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.	51	1.80	0.7216	3

As the means (mostly below 2.5) in Table 5.2 suggests, all the responses are more positive in nature, than negative.

5.3.2 UNI-VARIATE GRAPHS

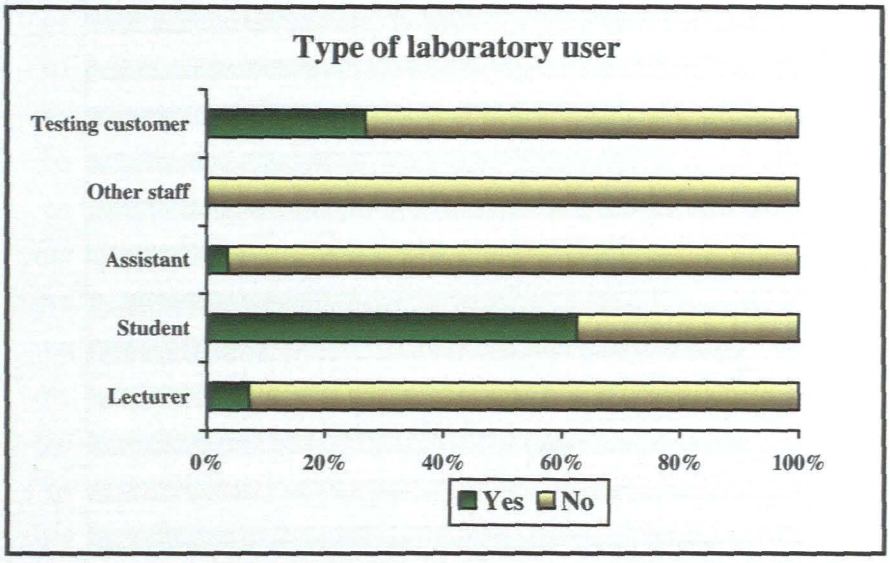

FIGURE 5. 1: 100% stack bar to indicate type of laboratory user

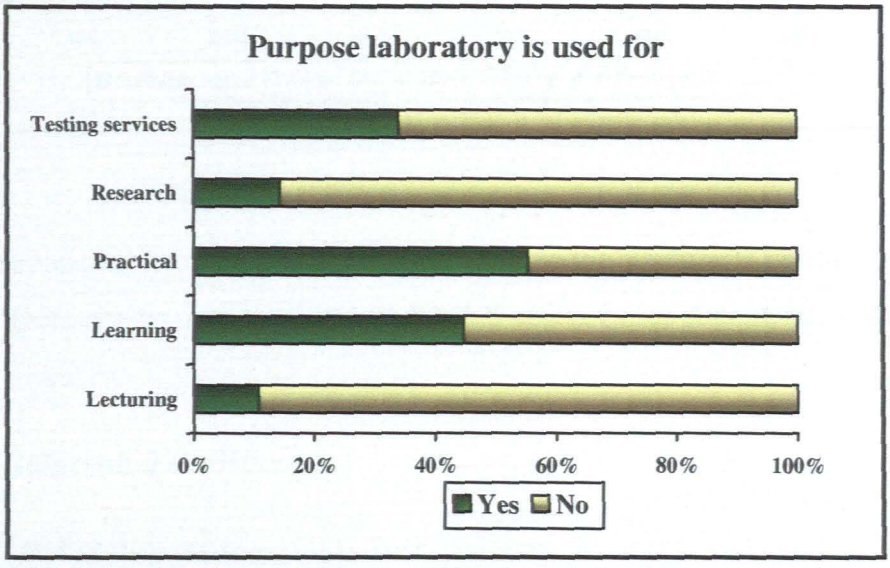

FIGURE 5. 2: 100% stack bar to indicate purpose laboratory is used

As depicted in Figures 5.1 and 5.2, the respondents that used the laboratory are mostly students and the purpose of using the laboratory is mostly of a practical or learning nature.

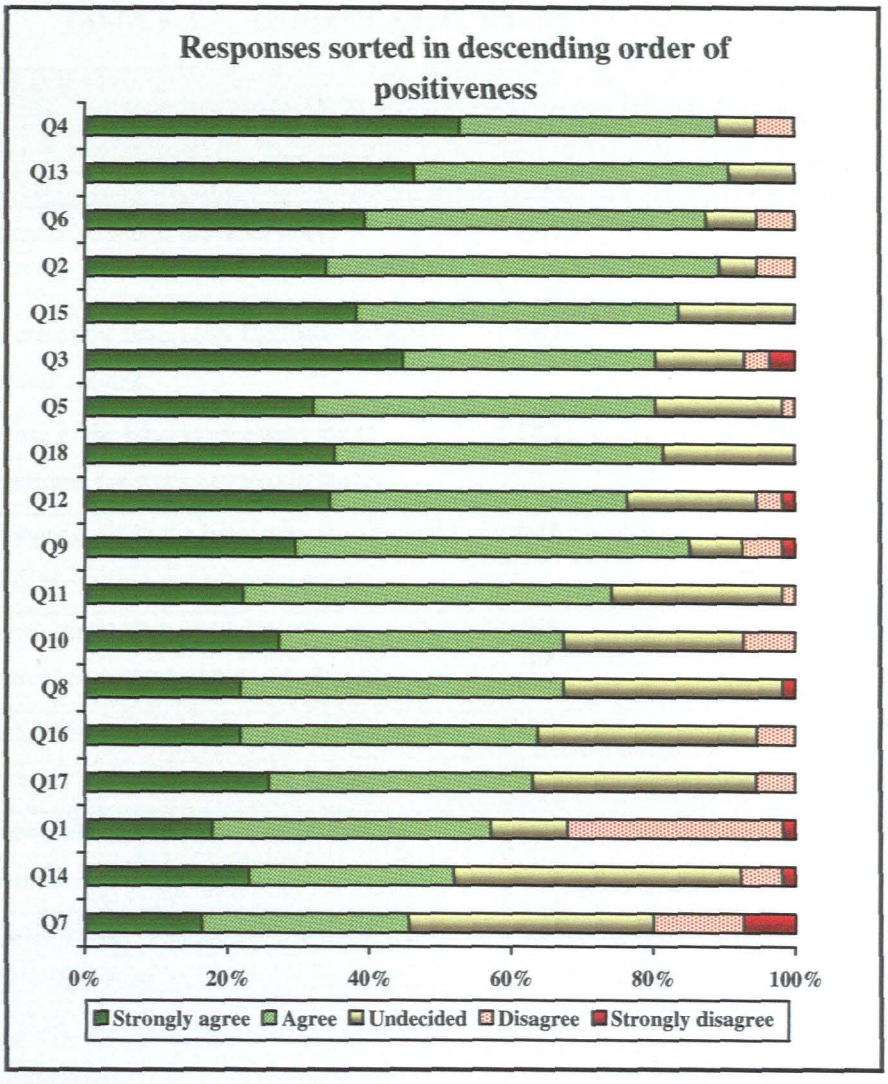

FIGURE 5. 3: 100% stack bar for responses on statements

The respondents mostly agree to strongly agree to the statements posed to them. It is of importance to note the large undecided category for statements 7, 8, 14, 16 and 17.

5.3.3 Inferential statistics

5.3.3.1 Reliability testing

A reliability test (Cronbach's Alpha Coefficient) was executed on all the items (statements), which represent the measuring instrument of this survey. According to the Cronbach's Alpha Coefficients for raw variables (0.8747) and those for standardized variables (0.8741), which were more than the acceptable level of 0.70, this questionnaire proves to be reliable and consistent. Nunnaly (1978:44) has indicated 0.7 to be an acceptable coefficient.

TABLE 5. 3: Cronbach's Alpha Coefficient for student questionaires

Statements	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
1. I often make use of the laboratory.	Q01	0.6044	0.8636
2. The use of the laboratory facilitates industry problem solving.	Q02	0.4179	0.8710
3. The use of the laboratory assists me to understand the work covered in theory.	Q03	0.5496	0.8662
4. The equipment in the laboratory is sufficient to cover my testing and practical needs.	Q04	0.5565	0.8660
5. The consumables in the laboratory are sufficient to cover my testing and practical needs.	Q05	0.5081	0.8680
6. The laboratory has sufficient test methods to cover my testing and practical needs.	Q06	0.4697	0.8693
7. I often make use of performance standards offered by the laboratory.	Q07	0.6706	0.8604
8. Students adhere to laboratory rules and instructions from lecturers and technicians.	Q08	0.2278	0.8781
9. The services offered by the laboratory are of high standard.	Q09	0.5525	0.8661
10. The laboratory has a system in place for scheduling incoming customer required tests.	Q10	0.4786	0.8690
11. The laboratory has a system in place for scheduling practical assignments.	Q11	0.4834	0.8688
12. The laboratory is very effective in terms of testing service delivery.	Q12	0.5563	0.8658
13. It is of importance that the laboratory seeks accreditation by the SANAS body.	Q13	0.3605	0.8727
14. In terms of SANAS accreditation requirements, the laboratory already meets most of the set requirements.	Q14	0.4153	0.8717
15. My company will benefit greatly if the laboratory's test methods are certified by the CSIR.	Q15	0.4374	0.8704
16. I am aware of the fact that some of the	Q16	0.6238	0.8633

Statements	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
laboratory's test methods are certified by the CSIR.			
17. This CSIR certification is considered an important aspect of my company.	Q17	0.4571	0.8697
18. SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.	Q18	0.5120	0.8680
Cronbach's Coefficient Alpha for standardized variable			**0.8741**
Cronbach's Coefficient Alpha for raw variables			**0.8747**

Cronbach's Alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct". Construct is the hypothetical variables (statements) that are being measured (Cooper & Schindler, 2006:216-217). More specific, Cronbach's alpha measures how well a set of items (or variables) measures a single uni-dimensional latent construct.

5.3.3.2 Chi-Square Test for equal proportions

There is evidence that the proportions for all the different statements were not equal. The chi-square test for equal proportions show that the H_o: $P_1=P_2$ are to be rejected, thus $P_1 \neq P_2$. This means that a significant higher / lower proportion of respondents indicated one category rather than one of the other categories. For instance, statistically significant more respondents 'Strongly agree' (33.9%) and 'Agree' (55.4%) than "disagree" (5.4%) for the statement: "The use of the laboratory facilitates industry problem solving".

The chi-square tests are statistically significant at the $\alpha=0.05$ level of significance for all the statements. This means the proportions for all the statements are not equal. The statistics can be seen in Table 5.4 and in Annexure B.

TABLE 5. 4: Chi-Square tests for equal proportions.

Question / Statement	Sample Size	Chi-Square	DF	P-Value
1. I often make use of the laboratory.	56	25.25	4	<0.0001***
2. The use of the laboratory facilitates industry problem solving.	56	39.71	3	<0.0001***
3. The use of the laboratory assists me to understand the work covered in theory.	56	40.61	4	<0.0001***
4. The equipment in the laboratory is sufficient to cover my testing and practical needs.	56	36.56	3	<0.0001***
5. The consumables in the laboratory are sufficient to cover my testing and practical needs.	56	26.43	3	<0.0001***
6. The laboratory has sufficient test methods to cover my testing and practical needs.	56	32.43	3	<0.0001***
7. I often make use of performance standards offered by the laboratory.	56	14.36	4	0.0062**
8. Students adhere to laboratory rules and instructions from lecturers and technicians.	56	22.02	3	<0.0001***
9. The services offered by the laboratory are of high standard.	56	55.44	4	<0.0001***
10. The laboratory has a system in place for scheduling incoming customer required tests.	56	11.98	3	00.0074**
11. The laboratory has a system in place for scheduling practical assignments.	56	27.33	3	<0.0001***
12. The laboratory is very effective in terms of testing service delivery.	56	35.45	4	<0.0001***
13. It is of importance that the laboratory seeks accreditation by the SANAS body.	56	14.11	2	0.0009***
14. In terms of SANAS accreditation requirements, the laboratory already meets most of the set requirements.	56	26.85	4	<0.0001***
15. My company will benefit greatly if the laboratory's test methods are certified by the CSIR	56	7.56	2	0.0228*

Question / Statement	Sample Size	Chi-Square	DF	P-Value
16. I am aware of the fact that some of the laboratory's test methods are certified by the CSIR.	56	15.62	3	0.0014**
17. This CSIR certification is considered an important aspect of my company.	56	12.22	3	0.0067**
18. SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.	56	6.33	2	0.0421*

5.4 DISCUSSIONS AND CONCLUSSIONS

The following analogies can be drawn from the statistical analysis:

- The equipment and consumables in the laboratory are sufficient and there are sufficient testing methods to cover respondents' testing and practical needs.
- It is of importance that the laboratory seeks accreditation by the SANAS body.
- The use of the laboratory facilitates industry problem solving.
- The respondents' companies will benefit greatly if the laboratory's test methods are certified by the CSIR.
- The use of the laboratory assists the respondents to understand the work covered in theory.
- SANAS accreditation at CPUT Testing laboratory will serve as a benchmark for other tertiary institutions to follow suit.
- The laboratory is very effective in terms of testing service delivery.
- The services offered by the laboratory are of high standard.
- The laboratory has a system in place for scheduling practical assignments.

All of the above analogies culminate in the conclusion which can be drawn that the CPUT TSCT testing laboratory, by implication in terms of industry and tertiary requirements, is subjected to a forced intervention to obtain SANAS accreditation.

CHAPTER 6: CONCLUSION

6.1 BACKGROUND

In the research thus far, the scope of the research was elaborated upon in Chapter one and a holistic perspective of SANAS accreditation of the TSCT testing laboratory was provided in Chapter two, under the following headings:

- Introduction to textiles.
- Background to textile industry in South Africa.
- Benefits of the industry.
- The Textile Federation of South Africa.
- The Textile Federation members.
- Factors impacting on the textile industry of South Africa.
- Clothing and Textile Interim Development program.

In Chapter 3 a literature review was conducted on the primary theme of the dissertation, namely that of the SANAS accreditation for the CPUT TSCT testing laboratory. Furthermore, the ISO in terms of structure, development, importance, significance and benefits was elaborated upon in detail. In addition, to place the accreditation in perspective of the overall research, laboratory accreditation bodies, namely the SABS, the ILAC and the L-A-B was analysed in detail.

In Chapter 4 the research design and methodology was elaborated upon in detail to ultimately culminate in the data analysis and interpretation of the results in Chapter 5. In this final chapter, the research will be concluded and final analogies drawn.

6.2 THE RESEARCH PROBLEM REVISITED

The research problem which was research within the ambit of this dissertation, reads as follows:

"*Industry demands that the CPUT TSCT testing laboratory obtain SANAS accreditation*".

The research problem in the opinion of this author will be mitigated should the recommendations made in Paragraph 6.6 of this chapter, be implemented.

6.3 THE RESEARCH QUESTION REVISITED

The research question which forms the crux of this dissertation reads as follows:

"Will the CPUT TSCT testing laboratory subject to a forced intervention for SANAS accreditation, meet the set requirements?"

The research question will be addressed from two perspectives, namely:

- From the perspective of an industry and tertiary requirement where by implication the CPUT TSCT testing laboratory is subjected to a forced intervention to attain SANAS accreditation. This analogy flows from the conclusions drawn from the descriptive and inferential statistics (Refer Chapter 5).

- From the perspective of compliance to the SANAS accreditation requirements. Should the CPUT TSCT testing laboratory comply with SANAS requirements as elaborated upon in Chapter 3 of this dissertation, SANAS accreditation to the laboratory will be granted.

6.4 THE INVESTIGATIVE QUESTIONS

The investigative questions formulated in support of the research question, can be answered from the research findings and literature review conducted in this dissertation. The investigative questions read as follows:

- How would the CPUT TSCT testing laboratory go about seeking SANAS accreditation?

  There is a process of application for accreditation that should to be followed by the CPUT TSCT testing laboratory (SANAS, 2008*f*:**Online**). This process is elaborated upon in Figure 3.1, Paragraph 3.4, Chapter 3.

- Will the CPUT TSCT testing laboratory meet the requirements for SANAS accreditation?

  Test laboratories who seek accreditation must comply with the requirements set out by SANAS. Provided that the CPUT TSCT testing laboratory meets

these requirements set out by SANAS, the laboratory should obtain its accreditation (SANAS, 2008*e*:**Online**).

- What benefits would the laboratory gain for the CPUT with the SANAS accreditation?

  The laboratory would gain the benefit of obtaining formal recognition from SANAS for being competent to carry out specific tasks. The laboratory will in addition have the benefit of using the SANAS logo on their certificates, test reports, letterheads and their promotional material (SANAS, 2008*g*:**Online**). Furthermore, the information regarding the laboratory will be added to a database, which is accessible to other accredited laboratories and prospective customers (SANAS, 2008*h*:**Online**)..

- What benefits would there be for the industry if the laboratory gains SANAS accreditation?

  The use of set standards make the development, manufacturing and supply of products and services more efficient, safer and cleaner (ISO, 2008*s*:**Online**). In addition to this, it facilitates trade between countries and create wide international acceptance of products and services in all industry sectors. Furthermore it will enhance competitiveness in South Africa (SABS, 2008*h*:**Online**).

- How will the CPUT TSCT testing laboratory ensure the effectiveness of the laboratory system, with regard to the fact that in addition, the laboratory is used for teaching and learning purposes?

  Provided that all parties involved in the testing, teaching and learning operations of the laboratory adhere to and maintain the requirements of SANAS accreditation, the effectiveness of the laboratory system can be assured.

6.5 KEY RESEARCH OBJECTIVES REVISITED

The key research objectives of this dissertation:

- To determine what the requirements are for SANAS accreditation by the CPUT TSCT testing laboratory.
- To determine if the CPUT TSCT testing laboratory is subject to a forced intervention for SANAS accreditation.
- To determine the criteria required for the CPUT TSCT testing laboratory accreditation.
- To determine the benefits that could be gleaned from this accreditation.
- To determine the effectiveness of the laboratory system, with regard to the fact that in addition to testing, the laboratory is used for teaching and learning.

The research objectives in the opinion of this author were met in terms of the directives contained within the ambit of the literature review (Chapter3) and survey results (Chapter 5).

6.6 RECOMMENDATIONS

The recommendations to mitigate the research problem and to provide an answer to the research question and associated investigative questions the following:

- The laboratory should make application for SANAS accreditation to meet their customer's testing needs.
- All laboratory technicians must attend the training courses offered by SANAS pertaining to accreditation of facilities.
- Once the laboratory technicians have completed their training, they should put the processes and procedures in place in order to meet the requirements set out by SANAS
- The laboratory needs to formulate a quality manual.
- The laboratory should put structures in place to ensure the effectiveness of the laboratory system with regard to the fact that the in addition the laboratory is used for teaching and learning purposes.

6.8 CONCLUSION

The research contained within the ambit of this dissertation clearly shows that SANAS accreditation for the CPUT TSCT testing laboratory is a mandatory requirement as opposed to an optional choice. Benefits are far reaching, not only

for the institution and its students, but for the textile industry and the country as a whole.

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ANNEXURE A:

Following are the Calibration Laboratory certificate numbers (SABS, 2008*f*:**Online**):

HEAD OFFICE - GAUTENG - PRETORIA

021 - Dimensional Metrology
124 - Electrical (DC low frequency) Metrology
206 - Pressure Metrology
307 - Temperature Metrology
801 - Force Metrology
1201 - Radiation Dosimetry Metrology
1308 - Acoustics Metrology
1501 - Humidity Metrology

WESTERN CAPE, CAPE TOWN

815 - Force Metrology

With regards to process control the Force Metrology certificate number 815 is used for the calibration of test and measuring equipment that are utilized by test laboratories that comply with South African National Standards (SANS) technical specifications, and manufacturing organizations, including ISO 9000 listed companies. Calibration laboratories form the connection between national standards and the working standards to ensure traceability to national and international standards.

Following are the Testing Laboratory certificate numbers for the testing of goods and products that are manufactured by organizations to specified SANS methods and procedures (SABS, 2008*b*:**Online**):

HEAD OFFICE GAUTENG:

- **Chemical Industry:**
  - T0027 - Industrial Chemistry & Petrochemicals.

- T0318 - Rubber & Plastics and Paints & Sealants.

- **Electro technical Industry:**
  - T0066 - Electronics & Appliances.
  - T0085 - Lighting Technology.
  - T0095 - Explosion Prevention Technology.
  - T0157 - Rotating Machines.
  - T0159 - NETFA: High Current Materials and Installation, Short Circuit and High Voltage, High Power and Materials.
  - T0178 - Heat Transfer.

- **Food & Health Industry:**
  - T0065 - Radiation Protection Service.
  - T0192 - Condom Testing.
  - T0269 - Food & Pharmaceutical Microbiology.
  - T0270 - Chromatographic Services.
  - T0319 - Food Chemistry.
  - T0320 - Pharmaceutical Chemistry.
  - G0002 - OECD Principles – GLP.
  - PTS0003 - Water Chemical Analysis.

- **Mining and Minerals Industry:**
  - T0144 - Chemical Analysis - Leeuwpan: Delmas.
  - T0204 - Chemical Analysis – Springlake.
  - T0230 - Chemical Analysis – Secunda.
  - T0246 - Chemical Analysis - Richards Bay.
  - T0294 - Chemical Analysis - West Coast: Saldanha.

- **Mechanical and Materials Industry :**
  - T0026 - Building & Construction and Packaging & Mechanical.
  - T0196 - Mechanical and Fluid Technology.
  - LTF0227 - Water Meter Verification.
  - T0321 - Fibre & Polymer.
- **Transportation Industry:**
  - T0176 - COP & Battery Technology: East London.
  - T0238 - Vehicle Systems & Vehicle Components: Pretoria.

EASTERN CAPE REGIONAL OFFICE

- P0001 - Microbiology: Port Elizabeth.

WESTERN CAPE REGIONAL OFFICE

- T0090 - Water Testing.
- T0113 - Microbiology: Western Cape Cape Town.
- T0250 - Microbiology: Walvisbay, Namibia.

With respect to laboratory activities, it is the policy of SABS Commercial test and calibration laboratories to offer services that comply with the requirements as specified in standard ISO/IEC 17025 'General requirements for competence of testing and calibration laboratories' and, where relevant, the OECD guidelines on Good Laboratory Practice (GLP) (SABS, 2008*f*:**Online**).

With respect to certification of SABS Commercial's Training Centre, the Southern African Auditor & Training Certification Association (SAATCA) has certified the Training Centre of SABS Commercial (Pty) Ltd. SAATCA has additionally been accredited by SANAS to standard ISO/IEC 17024:2003 'Conformity assessment – General requirements for bodies operating certification of persons' (SABS, 2008*g*:**Online**),. Furthermore, SAATCA is a member of the International Personnel Certification Association. SABS Commercial (Pty) Ltd

holds the following accreditations from the Raad voor Accreditatie (RVA) - the Dutch Accreditation Council:

- Certificate number C109 for providing certification of the Quality Management System (QMS) of organisations that complies with the requirements of standard ISO 9001:2000.
- Certificate number C438 for providing certification of the Environmental Management System (EMS) of organisations that complies with the requirements of standard ISO 14001:2004.

SABS Commercial (Pty) Ltd holds accreditation from the Verband der Automobilindustrie e.V., which includes the Qualitäts Management Centre (VDA-QMC) the German Automotive Accreditation Body and Oversight Office for accreditation in the Automotive Industry in Germany and Africa Certificate number 2-IAO-QMC-01013 for providing certification of the Quality Management System of organisations that complies with the requirements of standard "ISO/TS 16949:2002 Quality management systems. This is the particular requirements to be met for the application of ISO 9001:2000 for automotive production and relevant service part organizations (SABS, 2008*g*:**Online**).

ANNEXURE B:

Descriptive statistics for each variable

QA1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	52	92.86	52	92.86
Yes	4	7.14	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	41.1429
DF	1
Pr > ChiSq	<.0001

Sample Size = 56

QA2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	21	37.50	21	37.50
Yes	35	62.50	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	3.5000
DF	1
Pr > ChiSq	0.0614

Sample Size = 56

QA3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	54	96.43	54	96.43
Yes	2	3.57	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	48.2857
DF	1

Pr > ChiSq <.0001

Sample Size = 56

QA4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	56	100.00	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square 0.0000

DF 0

Pr > ChiSq .

Sample Size = 56

QA5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	41	73.21	41	73.21
Yes	15	26.79	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square 12.0714

DF 1

Pr > ChiSq 0.0005

Sample Size = 56

QB1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	50	89.29	50	89.29
Yes	6	10.71	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square 34.5714

DF 1

Pr > ChiSq <.0001

Sample Size = 56

QB2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	31	55.36	31	55.36
Yes	25	44.64	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.6429
DF	1
Pr > ChiSq	0.4227

Sample Size = 56

QB3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	25	44.64	25	44.64
Yes	31	55.36	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.6429
DF	1
Pr > ChiSq	0.4227

Sample Size = 56

QB4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	48	85.71	48	85.71
Yes	8	14.29	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	28.5714
DF	1
Pr > ChiSq	<.0001

Sample Size = 56

Q85	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	37	66.07	37	66.07
Yes	19	33.93	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	5.7857
DF	1
Pr > ChiSq	0.0162

Sample Size = 56

Q01	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	10	17.86	10	17.86
Agree	22	39.29	32	57.14
Undecided	6	10.71	38	67.86
Disagree	17	30.36	55	98.21
Strongly disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	25.2500
DF	4
Pr > ChiSq	<.0001

Sample Size = 56

Q02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	19	33.93	19	33.93
Agree	31	55.36	50	89.29
Undecided	3	5.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 39.7143

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q03	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	25	44.64	25	44.64
Agree	20	35.71	45	80.36
Undecided	7	12.50	52	92.86
Disagree	2	3.57	54	96.43
Strongly disagree	2	3.57	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 40.6071

DF 4

Pr > ChiSq <.0001

Sample Size = 56

Q04	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	29	51.79	30	53.57
Agree	20	35.71	50	89.29
Undecided	3	5.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 56.5000

DF 4

Pr > ChiSq <.0001

Sample Size = 56

			Cumulative	Cumulative

Q05	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	18	32.14	18	32.14
Agree	27	48.21	45	80.36
Undecided	10	17.86	55	98.21
Disagree	1	1.79	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	26.4286
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q06	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	22	39.29	22	39.29
Agree	27	48.21	49	87.50
Undecided	4	7.14	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	32.4286
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q07	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	9	16.07	10	17.86
Agree	16	28.57	26	46.43
Undecided	19	33.93	45	80.36
Disagree	7	12.50	52	92.86
Strongly disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 25.8571

DF 5

Pr > ChiSq <.0001

Sample Size = 56

Q08	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	12	21.43	13	23.21
Agree	25	44.64	38	67.86
Undecided	17	30.36	55	98.21
Strongly disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 38.6429

DF 4

Pr > ChiSq <.0001

Sample Size = 56

Q09	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Strongly agree	16	28.57	18	32.14
Agree	30	53.57	48	85.71
Undecided	4	7.14	52	92.86
Disagree	3	5.36	55	98.21
Strongly disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 71.0714

DF 5

Pr > ChiSq <.0001

Sample Size = 56

Q10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	15	26.79	16	28.57
Agree	22	39.29	38	67.86
Undecided	14	25.00	52	92.86
Disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	26.3214
DF	4
Pr > ChiSq	<.0001

Sample Size = 56

Q11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Strongly agree	12	21.43	14	25.00
Agree	28	50.00	42	75.00
Undecided	13	23.21	55	98.21
Disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	42.3929
DF	4
Pr > ChiSq	<.0001

Sample Size = 56

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent

0	1	1.79	1	1.79
Strongly agree	19	33.93	20	35.71
Agree	23	41.07	43	76.79
Undecided	10	17.86	53	94.64
Disagree	2	3.57	55	98.21
Strongly disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	50.7143
DF	5
Pr > ChiSq	<.0001

Sample Size = 56

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Strongly agree	25	44.64	27	48.21
Agree	24	42.86	51	91.07
Undecided	5	8.93	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	31.8571
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4	7.14	4	7.14
Strongly agree	12	21.43	16	28.57
Agree	15	26.79	31	55.36
Undecided	21	37.50	52	92.86
Disagree	3	5.36	55	98.21
Strongly disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 33.5714

DF 5

Pr > ChiSq <.0001

Sample Size = 56

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	21	37.50	22	39.29
Agree	25	44.64	47	83.93
Undecided	9	16.07	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 26.0000

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Strongly agree	12	21.43	13	23.21
Agree	23	41.07	36	64.29
Undecided	17	30.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 30.7857

DF 4

Pr > ChiSq <.0001

Sample Size = 56

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Strongly agree	14	25.00	16	28.57
Agree	20	35.71	36	64.29
Undecided	17	30.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	24.1786
DF	4
Pr > ChiSq	<.0001

Sample Size = 56

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Strongly agree	19	33.93	21	37.50
Agree	25	44.64	46	82.14
Undecided	10	17.86	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	21.8571
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q01	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Agree	32	57.14	32	57.14
Undecided	6	10.71	38	67.86
Disagree	18	32.14	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 18.1429

DF 2

Pr > ChiSq 0.0001

Sample Size = 56

Q02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Agree	50	89.29	50	89.29
Undecided	3	5.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 78.8929

DF 2

Pr > ChiSq <.0001

Sample Size = 56

Q03	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Agree	45	80.36	45	80.36
Undecided	7	12.50	52	92.86
Disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square 55.9643

DF 2

Pr > ChiSq <.0001

Sample Size = 56

Q04	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79

Agree	49	87.50	50	89.29
Undecided	3	5.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 116.8571

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q05	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Agree	45	80.36	45	80.36
Undecided	10	17.86	55	98.21
Disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 57.8929

DF 2

Pr > ChiSq <.0001

Sample Size = 56

Q06	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Agree	49	87.50	49	87.50
Undecided	4	7.14	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 73.9643

DF 2

Pr > ChiSq <.0001

Sample Size = 56

Q07	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	25	44.64	26	46.43
Undecided	19	33.93	45	80.36
Disagree	11	19.64	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	23.1429
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q08	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	37	66.07	38	67.86
Undecided	17	30.36	55	98.21
Disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	62.5714
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q09	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Agree	46	82.14	48	85.71

Undecided	4	7.14	52	92.86
Disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 97.7143

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	37	66.07	38	67.86
Undecided	14	25.00	52	92.86
Disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 57.0000

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Agree	40	71.43	42	75.00
Undecided	13	23.21	55	98.21
Disagree	1	1.79	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 70.7143

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	42	75.00	43	76.79
Undecided	10	17.86	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	77.8571
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Agree	49	87.50	51	91.07
Undecided	5	8.93	56	100.00

Chi-Square Test

for Equal Proportions

Chi-Square	74.1786
DF	2
Pr > ChiSq	<.0001

Sample Size = 56

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4	7.14	4	7.14
Agree	27	48.21	31	55.36
Undecided	21	37.50	52	92.86

Disagree	4	7.14	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 29.8571

DF 3

Pr > ChiSq <.0001

Sample Size = 56

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	46	82.14	47	83.93
Undecided	9	16.07	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 61.7500

DF 2

Pr > ChiSq <.0001

Sample Size = 56

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	1.79	1	1.79
Agree	35	62.50	36	64.29
Undecided	17	30.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test

for Equal Proportions

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Chi-Square 52.8571

DF 3

Pr > ChiSq <.0001

Sample Size = 56

			Cumulative	Cumulative

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Agree	34	60.71	36	64.29
Undecided	17	30.36	53	94.64
Disagree	3	5.36	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	48.1429
DF	3
Pr > ChiSq	<.0001

Sample Size = 56

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	3.57	2	3.57
Agree	44	78.57	46	82.14
Undecided	10	17.86	56	100.00

Chi-Square Test for Equal Proportions

Chi-Square	53.2857
DF	2
Pr > ChiSq	<.0001

Sample Size = 56

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q01	51	2.47059	1.10187	126.00000	1.00000	4.00000	Q01
Q02	51	1.84314	0.78416	94.00000	1.00000	4.00000	Q02
Q03	51	1.90196	1.04412	97.00000	1.00000	5.00000	Q03
Q04	51	1.64706	0.84436	84.00000	1.00000	4.00000	Q04
Q05	51	1.90196	0.75511	97.00000	1.00000	4.00000	Q05
Q06	51	1.74510	0.74413	89.00000	1.00000	4.00000	Q06
Q07	51	2.52941	1.04600	129.00000	1.00000	5.00000	Q07
Q08	51	2.15686	0.85726	110.00000	1.00000	5.00000	Q08
Q09	51	1.90196	0.85452	97.00000	1.00000	5.00000	Q09
Q10	51	2.11765	0.93053	108.00000	1.00000	4.00000	Q10
Q11	51	2.05882	0.75926	105.00000	1.00000	4.00000	Q11
Q12	51	1.96078	0.93725	100.00000	1.00000	5.00000	Q12
Q13	51	1.64706	0.65798	84.00000	1.00000	3.00000	Q13
Q14	51	2.37255	0.95835	121.00000	1.00000	5.00000	Q14
Q15	51	1.78431	0.70182	91.00000	1.00000	3.00000	Q15
Q16	51	2.15686	0.85726	110.00000	1.00000	4.00000	Q16
Q17	51	2.17647	0.88783	111.00000	1.00000	4.00000	Q17
Q18	51	1.80392	0.72165	92.00000	1.00000	3.00000	Q18

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.874741
Standardized	0.874065

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q01	0.604419	0.863643	0.606110	0.863169	Q01
Q02	0.417890	0.871009	0.417779	0.870452	Q02
Q03	0.549643	0.866153	0.552402	0.865273	Q03
Q04	0.556535	0.865953	0.559225	0.865007	Q04
Q05	0.508094	0.868001	0.501746	0.867237	Q05
Q06	0.469738	0.869302	0.475034	0.868266	Q06

Q07	0.670600	0.860418	0.667975	0.860719	Q07
Q08	0.227851	0.878125	0.218252	0.877883	Q08
Q09	0.552495	0.866073	0.545387	0.865546	Q09
Q10	0.478638	0.868977	0.467951	0.868537	Q10
Q11	0.483365	0.868815	0.456521	0.868975	Q11
Q12	0.556286	0.865761	0.557912	0.865058	Q12
Q13	0.360473	0.872728	0.368685	0.872307	Q13
Q14	0.415277	0.871714	0.426150	0.870133	Q14
Q15	0.437400	0.870419	0.441041	0.869566	Q15
Q16	0.623799	0.863315	0.619569	0.862639	Q16
Q17	0.457070	0.869741	0.465963	0.868613	Q17
Q18	0.512052	0.868016	0.515520	0.866705	Q18

ANNEXURE C:

C1: The Textile Federation members. **Source:** Texfed (2008*a*:Online)

PRODUCT:	COMPANY	EMAIL ADDRESS	WEBSITE
Sewing Threads	American & Efird (SA)	**ae@sabias.co.za**	
Polyester/Viscose & Woollen Fabrics	Aranda Fabrics		
Blankets & Rugs	Aranda Textile Mills	**nmagni@aranda.co.za**	
Yarns	Associated Spinners	**tscaife@iafrica.com**	
Filtration & Non Woven Fabrics	Beier Albany & Co	**wbeier@beiersa.co.za**	
Laminators & Fabrics	Breathetex	**info@breathetex.co.za**	**http://www.breathetex.com/**
Non Woven Fabrics & Products	Brits Textiles	**aqeelah@brits.co.za**	
Towels & Towelling Products	Colibri Towelling	**sales@belgotex.co.za**	**http://www.colibri.co.za/**
Spun Bonded Fabrics	Cordustex	**tadlam@bbacordustex.co.za**	**http://www.cordustex.co.za/**
Cotton Broker	Cotton Commodity Services	**cotton@global.co.za**	
Textile Research & Development	CSIR - Textek	**atembo@csir.co.za**	**http://www.csir.co.za/**
Yarns, Fabrics & Home Textiles	Da Gama Textile Company	**dagama@iafrica.com**	**http://www.dagama.com/**
Towels & Towelling Products	Dano Textile Industries	**glodina@glodina.co.za**	
Denim Fabric & Canvas	de Nim Textiles	**dalvi@de-nim.com**	
Fabric Dyers	Dyefin Textiles	**dyefin@dyefin.co.za**	
Yarns, Fabrics &	Frame Textile		**http://www.frame.co.za/**

Home Textiles	Group		
Apparel & Speciality Fabrics	Gelvenor Textiles	**dcoetzee@gelvenor.co.za**	**http://www.geltex.co.za/**
Knitted Fabrics	Gregory Knitting Mills	**mailbox@gregory.co.za**	
Linen Fabrics	Herdmans	**hbotes@herdmans.co.za**	
Worsted Yarns, & Fabrics	Hextex	**hextex@romatex.co.za**	
Polyester Fibre	Hosaf Fibres	**hosaf@hosaf.co.za**	
Industrial Fabrics	Industex Technical Textiles		
Tyre Cord	Industyre		
Labels & Trimmings	International Trimmings SA	**fchristopher@sabias.co.za**	**http://www.sabias.co.za/**
Transfer Printers	Loomcraft Fabrics CC	**loomcraft@54.co.za**	
P/V, Linen & Woollen Fabrics	Mediterranean Textile Mills	**charvey@mtm.co.za**	**http://www.mtm.co.za/**
Elastomeric Threads	Modulastic	**doce@mweb.co.za**	
Knitted Fabric	Mortex Knits	**mortex@webmail.co.za**	
Knitted Fabrics	Nettex	**alee@nettex.co.za**	
Knitted Fabrics	Ninian & Lester	**fabric@nintex.co.za**	**http://www.ninian.co.za/**
Cotton Yarns	Prilla 2000	**sales@prilla.co.za**	
Home Textiles	Romatex Home Textiles	**pkwak@romatex.co.za**	
Knitted Fabrics	Rotex Fabrics	**rotex.atlantis@cis.co.za**	
Worsted Fabrics	SA Fine Worsteds	**worsteds@safine.co.za**	
Polyester & Nylon Yarns	Sans Fibres	**bradp@sans.co.za**	**http://www.sans.co.za/**
Woven Fabrics	SBH Cotton Mills	**sales@sbhcotton.co.za**	
Interlinings	Stroud Riley	**bpenlington@chargeurs-**	

		interlining.com	
Woven fabrics	Suntex	**texsun@iafrica.com**	**http://www.suntex.co.za/**
Woven & Knitted Home Textiles	Svenmill	**svenmill@iafrica.com**	
Yarns	Table Bay Spinners	**admin@tbspinn.co.za**	
Knitted Fabrics	Team Puma	**andyw@teampuma.co.za**	
Linings & Home Textiles	Toga Linings	**sales@togalinings.co.za**	

Desiree Jaftha

Desiree Jaftha is a laboratory technician in the department of Clothing and Textile Technology at the Cape Peninsula University of Technology. Having specialised in textile technology, textile testing and her comprehensive industry experience, she is an invaluable asset to the CPUT.

She provides training on quality testing for people sent from industry and is a part time lecturer and lectures on the clothing Management National Certificate courses, where she cover the textile component of the course. In addition, she lectures on the full time Textile Technology and the Clothing Management National Diploma courses covering Quality Management and the Textile Testing and Statistics components. In addition to teaching she receives annual certificates from Woolworths for competence in textile testing.

Holding a Baccalaureus degree in Quality, Desiree takes a keen interest in continually furthering her studies and is currently reading for her Magister degree in Quality. All her research is based on textile testing.